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AUGUST 3, 1944

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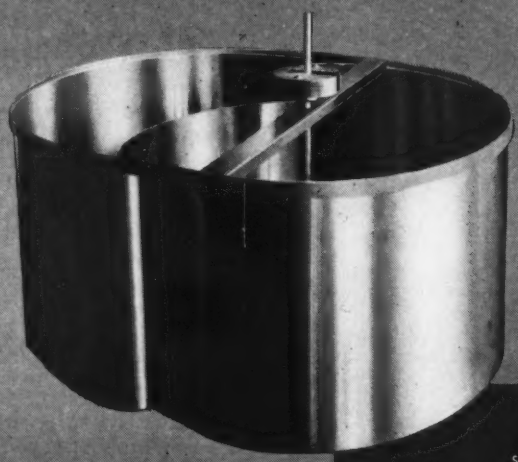

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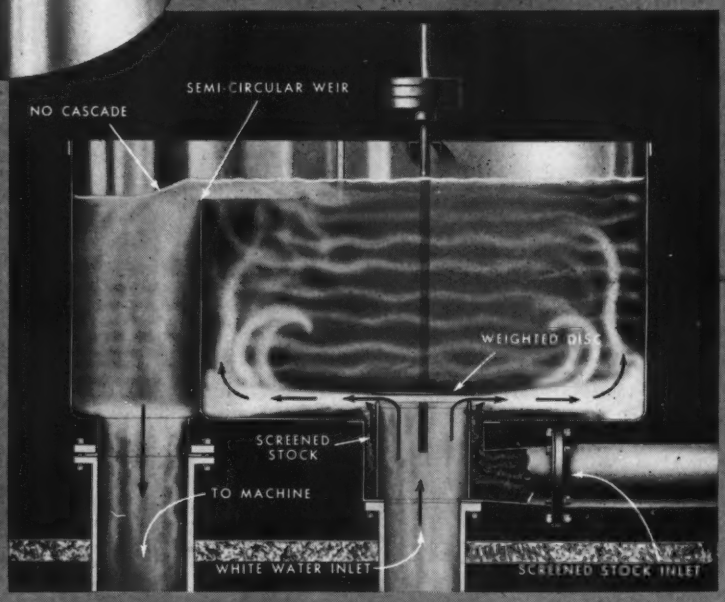

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PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.
Established 1872

Volume 119 Number 5

Published every Thursday by Lockwood Trade Journal Co., Inc.

Executive and Editorial Offices: 5 W. 47th St., New York 19, New York, U. S. A.

Tel. BRyant 9-0860 New York 19, N. Y.

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"TAPPI" Editor

LYNN M. LAMM
Washington Correspondent
All of 15 W. 47th St.

Western Representative:
H. K. VINTON
123 West Madison St., Chicago, Ill.

Subscriptions: (Payable in advance) By the year $4.00; Single Copy 10 cents.
Postage Extra: To Canada $2.00; To Other Foreign Countries $3.50.
Member Audit Bureau of Circulations

PAPER *established Feb. 17, 1899, combined with* PAPER TRADE JOURNAL *Nov. 16, 1899.* PAPER *established Sept. 21, 1910, combined with* PAPER TRADE JOURNAL, *Feb. 19, 1925.* *All rights to the above titles reserved.*

PAPER TRADE JOURNAL *is entered as Second Class matter at the Post Office at East Stroudsburg, Pa., under Act of Congress of March 3, 1879. Publication Office of Lockwood Trade Journal Co., Inc., 34 N. Crystal St., East Stroudsburg, Pa. Printed in U. S. A.*

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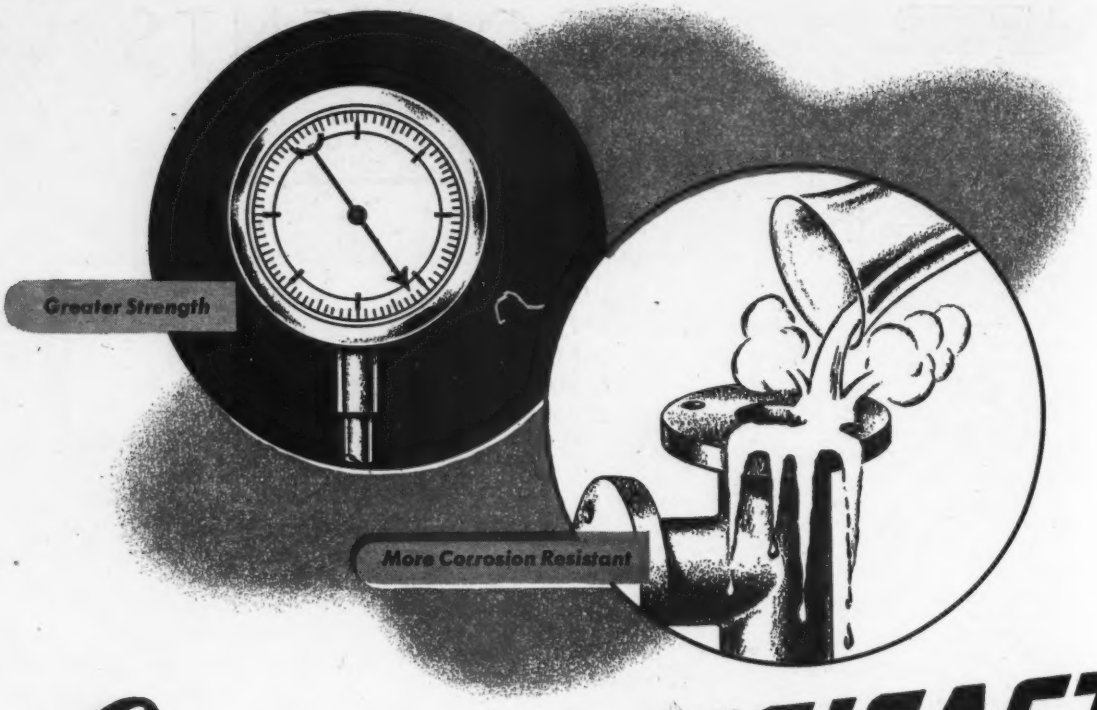

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August 3, 1944

WPB May Further Control Paper Industry

Director of Paper Division States Entire Paper Industry Must More Fully Cooperate To Produce Essential Needs—Alternative Is More Complete Priority Control Or All-Over Directives By the Army.

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944—The paper industry is faced with complete priority control of paper by the War Production Board, or will be subjected to over-all directives by the Army, unless the entire industry voluntarily cooperates in producing military and essential civilian papers, Rex W. Hovey, Director of the Paper Division, War Production Board, said today.

Tighter control over both the production and usage of all printing and writing paper will have to be exercised by the government to ensure adequate supplies for both military and essential civilian requirements, the three major segments of the printing paper industry were advised recently by officials of the War Production Board.

Members of the Industry Advisory Committees on Groundwood, Writing and Book Papers who met here July 26, 27 and 28 were told by Harold Boeschenstein, Acting Director of the Forest Products Bureau, that the production of paper must be kept up and increased if possible.

Raw Materials Up Through Cooperation

Pointing out that the supply of raw materials, including pulpwood and waste paper, had been increased through co-operation with WPB of a number of branches of the industry and many volunteer groups, despite the handicaps of manpower shortages, Mr. Boeschenstein indicated that pulp and paper production had not been able to keep pace with the rapid increase in war requirements.

"We must avoid wishful thinking that the war is about over, and consider increasing demands for paper and non-paper products made from wood pulp," he said. "Military requirements for packaging of all kinds, as well as increased requirements for nitration pulp for explosives, special pulps for military tires and other military uses have increased appreciably with the tempo of the war. Demands for many special papers have also been stepped up."

Mr. Boeschenstein explained that unless the supplies of raw materials could be further increased, this necessarily reduces the paper and paper products available for civilian requirements.

"We must step up paper production to meet the ever-growing requirements through the balance of the year, and further increase the production of wood and collection of waste paper if we are to continue to meet military demands," he said.

Reducing this problem to its simplest terms, he stated that, due to the increased needs of the government for these paper products, with production rising slowly and only in some areas, the inevitable conclusion is that there would be a decreased amount available for some civilian uses. Knowing that it is advisable to maintain a proper balance, he said that it would be necessary further to limit the uses of printing and writing papers by changing the present Printing and Publishing limitation orders if conditions do not improve materially.

Industry members pointed out that the printing and publishing orders did not guarantee that 75% by weight of the paper used in their base periods would be available, but that the maximum use permitted was 75%. Obviously, they claimed, a publisher or printer could not get 75% of his base period paper if the producers couldn't make and deliver it.

Only 65% of Output For Civilians

It was also pointed out that since the government's paper reserve requirement is now 35% of their total production, they would have only approximately 65% left for civilian usage, and not 75% as assumed by users in view of the present limitation orders.

Industry members unanimously advised that as they were unable to produce sufficient printing and writing papers to meet both military and civilian demands, the printing and publishing limitation orders be further restricted so that a balance between printing paper supply and demand could be affected.

The industry was told that the Forest Products Bureau Divisions are carefully checking and studying the whole situation and analyzing all limitation orders.

In order to meet the increased demand for printing papers, WPB's Office of Pulp Allocation has authorized certain paper mills with adequate wood supplies to make and use available groundwood pulp and has allocated to those mills enough additional sulphite pulp out of reserve supply to enable them to manufacture between 12,000 and 15,000 tons of groundwood papers, the committees were told.

The backed-up groundwood was released to paper mills for the production of printing papers on the condition that each participating mill accept government orders up to 20% prior to August 1 and 35% thereafter of its total paper production under Conservation Order M-241.

Reserve production up to 35% of a mill's total production, required beginning August 1 under Order M-241, was said not to be the maximum that could be imposed by the government, but it was believed that this would cover current requirements. Should further emergency demands arise, the War Production Board has authority to take up to 100% of a mill's production, it was said.

Insufficient Water Handicaps Log Driving

Large Quantities of Pulpwood Remain Piled On River Banks Far From the Mills — Suggests Nova Scotia Have Special Minister Assisted By Deputy Possessing Technical Knowledge of Forestry.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., August 1, 1944 — With log driving nearing completion in Eastern Canada, a new worry confronts pulp and paper manufacturers, for it is now quite apparent that a considerable portion of the anticipated supplies of pulpwood will not be available this season, owing to lack of sufficient water in many of the rivers to float logs down to the mills. This is due to the prolonged dry spell in the spring and early summer. In some places large quantities of the pulpwood cut during the winter remains piled on the river banks far away from the mills, and reports now coming in both from the forest regions of Quebec and from those in New Brunswick and Nova Scotia are to the effect that considerable quantities of the wood that was launched has been stranded and cannot be refloated unless heavy rain comes soon. Meanwhile the demand for both pulpwood and saw lumber exceeds supplies.

Big Timber Orders from United Kingdom

The British Ministry of Supply has announced that arrangements have been completed with the Canadian timber industry to supply "considerable" quantities of timber to Great Britain during the two years following the cessation of hostilities in Europe, and Trade Department officials in Ottawa have intimated that the value of the two-year contracts will be around $140,000,000.

Suggested Ministry of Forestry, Pulp and Paper

From time to time the suggestion has been put forward that a Ministry for Forestry, Pulp and Paper should be established by the federal government, along the lines of the present ministries for agriculture and fisheries. New point has been given to this suggestion by George E. Graham, of Kentville, N. S., vice-president of the Canadian Forestry Association, who, in an address in Halifax, pointed out that while there were plans by provincial governments to build many hundreds of permanent highways to help unemployment after the war, little is heard about commitments for rebuilding the forests of the country. He continued: "The question of using returned men in a provinces-wide scheme of forest development is being asked on all sides and demands a positive answer." He suggested that as far as Nova Scotia was concerned there was a strong feeling that the proper handling of the forest heritage of the province merited the full time of a special minister assisted by a deputy possessing technical knowledge of forestry. The people also wanted to see systematic handling of Nova Scotia's woodlots. "This," he said, "is a farm crop proposition and should engage the services of agricultural representatives who are in the best position to guide the farmer in his cutting and marketing."

As regards the setting up of a Dominion Ministry of Forestry, the main stumbling block is that 90 per cent of the forest lands in Canada are the property of the provinces, to which they are an important source of revenue, and the provinces are intensely jealous of any outside interference in respect to these holdings. On the other hand, the forestry industries provide Canada's most important lines of exports. In fact, in normal times the pulp and paper industry is the mainstay of Canada's position in respect to foreign exchange. Such supervision as there is in the federal field comes under several ministries, notably of the Department of Mines and Resources and the Department of Trade and Commerce. Men in the industry who are interested in promoting a sound postwar program for future development report that in attempts to further the program, they are referred back and forth from one department to another, and that no one appears interested enough to assume responsibility. They point out that apart from problems connected with marketing abroad, there are many questions of the highest importance that demand unified action such as the provinces separately cannot supply—such, for instance, as fire and insect pests and the lack of a national policy for scientific control designed to treat the forests on an annual crop basis rather than "mine" them as is too often the case at present. This matter is likely to be brought up at a forthcoming Dominion-Provincial conference.

Canadian Lumber for Europe

Dr. Richard Redler, in an address at the recent annual convention of the Canadian Manufacturers Association on "Europe as a Market for Canadian Goods," had some interesting things to say about the prospects for exporting goods of forest origin to European markets.

"All European countries have cut so deeply into their forest reserves," he said, "that heavy imports of timber and woodpulp will be required for a long time, if not permanently." He cited as one of the factors the advent of the charcoal-burning motor and of the engine which utilizes wood-gas as driving force, assuring his audience that these vehicles had replaced gasoline-driven cars all over Europe. Another item, he said, that must go into the list of wood uses is the making of wood fibres to replace wool and cotton both for industrial purposes and in clothing, adding that there were more people wearing wood fibres now than there are those who are still wearing conventional garb. As a result, the annual wood cut in Switzerland was said to have increased by 100% over pre-war levels, and similar rates of increase had been scored in most countries to take care of clothing needs and the many other uses that have been developed for wood. The very great amounts of lumber needed to repair bomb damage also had made substantial inroads into available reserves.

Admitting that Sweden was expected to be a very substantial factor in export market competition after the war, he said that only Finland, which has lacked the man power to exploit her forest resources, had maintained the vast preponderance of forest lands which had always been a feature of her economy. Thus Europe will be confronted after the war with an unprecedented need for timber in reconstruction.

Tomahawk Co. Acquires Control of Railroad

Line Built By Late W. H. Bradley Now Controlled By Tomahawk Kraft Paper Co.—Committee Discusses River Problems—Mills Re-elect Directors — Thilmany Bag Mill Has Perfect Safety Record.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., July 31, 1944—The Tomahawk Kraft Paper Company, Tomahawk, Wis., has acquired a controlling interest in the Marinette, Tomahawk & Western Railway Company, and T. S. Dvorak has been appointed as general manager.

The railroad's original line from Jersey City, Wis., to Bradley Junction, Wis., was built in 1888 by the late W. H. Bradley, prominent Tomahawk lumberman, who built the line to enable him to ship lumber from Tomahawk to Bradley, and from there over the Soo Line. The line from Tomahawk to Harrison was built about three years later, connecting with the North Western road at the sawmill site in the latter community. In 1896, the line from Tomahawk to Spirit Falls was completed, and the line to Gleason and Doering was built in 1900 to 1903, the latter being sold later to the Milwaukee road. The Spirit Falls line was discontinued about 15 years ago.

The lines to Bradley and Harrison now offer the only railroad shipping facilities for the Tomahawk Kraft Paper Company at the Wisconsin dam, near Tomahawk, and the main lines of the Milwaukee, Soo and North Western roads. The paper company's railroad also serves the Tomahawk Pulp Company at King's dam.

With the road, the paper company also acquires control of the Tomahawk Power Company.

Mr. Dvorak resigned recently as the Tomahawk manager of the district of the Wisconsin Public Service Corporation. He has had considerable experience in logging operations and the operation of logging railroads. It is expected that the road trackage will be rebuilt as fast as possible, to assure improved service.

Meet to Discuss River Problems

A committee headed by Dr. A. T. Lenz, Madison, Wis., professor of hydraulic engineering at the University of Wisconsin, met Tuesday, July 25, at the Wausau, Wis., office of the Wisconsin Valley Improvement Company to study river problems. Also present were M. W. Kyler, general manager of the improvement company, a committee member, and George E. Lyon, St. Paul, Minn., an engineer of the War Department.

Mr. Lyon also attended a public hearing last fall at Wausau on the flood control problem in the Wisconsin River basin. At that time stress was laid on the creation of the proposed Little Eau Pleine river reservoir and a canal which would take excess water from the Wisconsin River north of the Rothschild dam to this dam as a means of relieving the flood situation on the Wisconsin north of Mosinee and the Bull Junior Creek which crosses a highway north of Mosinee.

Mr. Lyon asserted at Wausau last week that this proposal is being studied at Washington, D. C., and that if findings are favorable a survey may be made later by a staff of federal engineers. He saw the possibility of making the proposal a postwar employment project.

The plan was submitted by the Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis., which pointed out its flood-control value along with its importance in regulating flowage at hydro-electric plants south of Wausau.

The Little Eau Pleine reservoir proposal is part of a major plan which called for the building of the Big Eau Pleine reservoir and the Du Bay Hydro-electric dam south of the Marathon-Portage county line, both of which installations have been completed. The Little Eau Pleine reservoir would be the second largest body of water in Wisconsin and would impound much more water than is contained in all the other reservoirs on the Wisconsin River combined.

The committee made plans for further study of snowfalls, runoffs, percolation of underground waters and advisable locations of more snowfall and rainfall gauges in the Wisconsin Valley.

Consolidated Reelects Directors

The fiftieth anniversary of Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis., incorporated in 1894, occurred Friday, July 28, George W. Mead, president, pointed out in his report at the annual stockholders' meeting in the company's main offices on Wednesday, July 26.

Thirty-seven stockholders were present. They reelected the following directors: George W. Mead, Stanton Mead, Walter Mead, Ralph R. Cle and Theo. W. Brazeau. The directors reelected the three first-named, respectively, as president, vice president and treasurer, and vice president; Mr. Cole, secretary; Earl A. Starks, assistant secretary, and Thomas J. Duda, controller.

The president's report dealt chiefly with activities of the company's plastics division. Stanton Mead reported on the company operations, and Mr. Cole on the financial status.

Ahdawagam Directors Reelected

Stockholders of Ahdawagam Paper Products Company, meeting July 26 in the company's offices at Wisconsin Rapids, Wis., reelected all directors, including George W. Mead, Ralph R. Cole, Walter Mead, Cloy K. Crouse and Frank Walsh.

At the directors' meeting, George W. Mead was reelected president; Mr. Walsh, vice president; Mr. Crouse, secretary, and Mr. Cole, treasurer. Mr. Walsh read the manager's report, and Mr. Crouse, the sales manager's report.

Thilmany For Perfect Safety Record

The Thilmany Pulp and Paper Company's bag mill at Kaukauna, Wis., had a perfect record in the National Safety Council contest for the period of July 1, 1943, through June 30, 1944, L. C. Smith, personnel manager, announced last week. The bag mill is entered in the Paper and Board Re-Manufacturing group, and this is the third successive year that this unit made a perfect record. The last lost-time accident at the bag mill occurred April 26, 1940, but the bag mill was not entered in the contest as an independent unit until 1941.

New Ruling May Help Pulpwood Situation

Amended Price Ceiling Regulations Expected To Add Some Relief But Low Water In Canada Keeps Pulpwood Movement Down—Cites Lack of An Adequate Forest Program—Other Industry News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., July 31, 1944—Once again the pulp and paper industries are suffering the effects of the uncertainties of weather. The drought in the northern woods is keeping much of last winter's pulpwood supplies piled on the banks of the rivers. This is more particularly true of central Canada. Concern is felt by both Canadian and United States interests.

A new ruling of the Wartime Prices and Trade Board, however, promises a modicum of relief. Timber Administrator A. H. Williamson has announced an amendment to the price ceiling regulations so as to permit the payment of higher prices when wood is purchased by a mill through established dealers or brokers. There is no change in the maximum prices, but the new order provides that dealers may add a charge of 40 cents per cord for handling rough pulpwood and 60 cents a cord for peeled pulpwood. Brokers' commissions are to be 75 cents and $1 per cord for rough and peeled pulpwood, respectively.

To Increase Deliveries from Farmers

One purpose of the new order is to increase deliveries from farmers and settlers by offering an incentive to brokers and dealers to finance and arrange transportation and help in the fair distribution of wood among the mills. The Financial Post, Toronto, today states that a canvass of opinion among leaders in the forest products industries reveals increasing sentiment that establishment of a Dominion ministry of forestry, pulp and paper has become a vital need to meet problems facing what normally is Canada's most important export industry.

Cites Lack of Adequate Forest Program

Steady depletion of Canada's forest wealth, it says, not only due to wasteful wood-cutting practices, but also due to inadequate measures to combat tremendous annual losses from insect and fire damage, has been causing increasing concern in the industry. Efforts to obtain government co-operation in stemming the steady depletion of accessible wood stands have run into difficulties. The Federal government has direct control over a very limited percentage of the forest lands that can be exploited commercially. The Provinces control 90% of the forest lands in Canada and are intensely jealous of their jurisdictional rights over these holdings, from which an important part of revenues of some Provinces is derived, through timber-cutting rights, etc.

Pulp and paper men say that lately, in efforts to get attention for a sound post-war program for future development, the industry has been shuttled back and forth from one department to another, with no one apparently anxious, or even interested, to assume responsibility.

More Unified Government Effort Needed

All Provincial government maintain departments to combat fire and insect damage to forest, but there is no unity, and some Provinces, it is held, have relatively low budgets for such work. It is pointed out that the Federal government maintains departments of mines and agriculture and these industries are also bound up with Provincial rights, yet they are no more important than the forest products industries.

The Post gives comparative figures to show the importance of pulp and paper as against these other industries and points out that industries of "forest origin" in the period between the first war and the present war, created some $15 billions of national income, of which approximately half was money, or purchasing power, from outside the country, that was used to bring in imported goods and raise living standards. During this period the most accessible forest wealth has been "mined" instead of scientifically used, and costs in the forest industries have been moving upwards as the "plush" period has been moving back into the past. To meet the problem it has been suggested that the Federal government should institute some central control such as has been developed in Scandinavian countries.

More Waste Paper Must Be Collected

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., July 31, 1944—Norman E. Scott, regional chief of the paper section of the War Production Board, states that New England's gigantic salvaging program, one of the most extensive in the country, will not be enough to supply the mills unless efforts are tremendously increased. Mr. Scott intimates that the mills may be forced to shut down because of the shortage of waste paper despite increasing demands by the military authorities.

He points out that as the United States forces widen their holdings in Europe and the Pacific area, the demand for battle front equipment made of paper has increased tremendously, placing a severe strain on paper mills already handicapped by lack of raw materials.

He cites the vast quantities of paper used by the Allied forces as the battle fronts continually expand in the direction of Berlin and Tokio. "In present day warfare," Mr. Scott says, "waste paper, as an ingredient of material use on the front line is every bit as important as the steel and explosives used in making shells."

Troy Concern Make Great Salvage Record

[FROM OUR REGULAR CORRESPONDENT]

TROY, N. Y., July 31, 1944—Industries of this section have collected 360,938 pounds of scrap paper during the past month, according to announcement from the Industrial Salvage Committee, making a total of 34,477,357 pounds reported to the government. Among the concerns reporting were the Albia Box and Paper Company, Behr-Manning Corporation, Cohoes Envelope Company, Cohoes Iron Foundry and Machine Company, John Leggett & Son, John A. Manning Paper Company, Mohawk Paper Mills, Noble & Wood Machine Company, and the Wood Flong Corporation.

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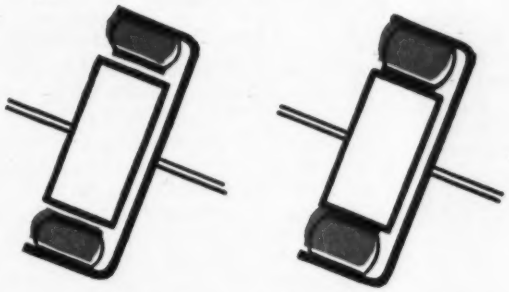

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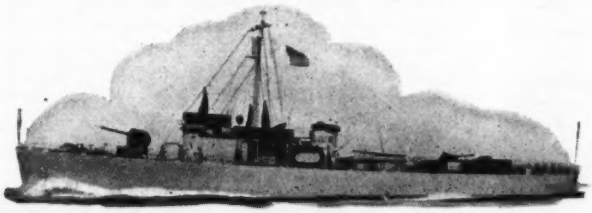
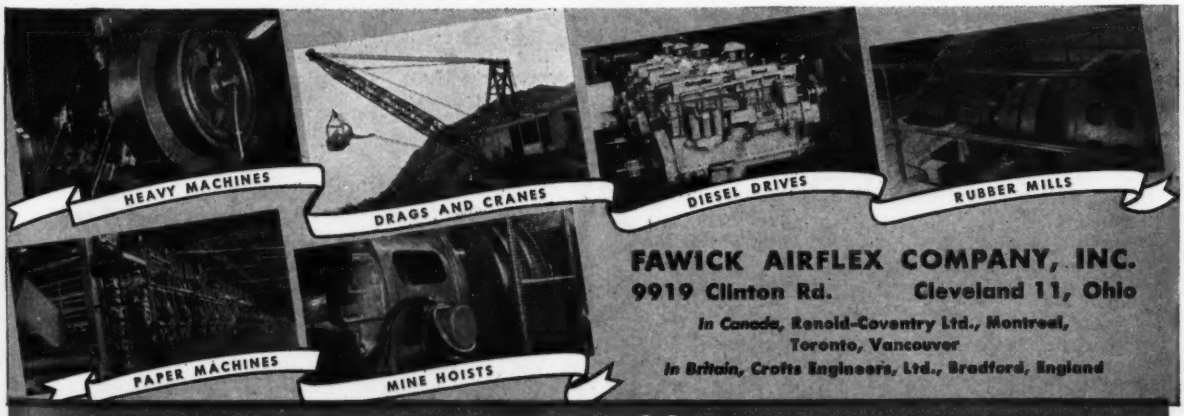
12. Acts as clutch, slip-clutch, brake and coupling.

Here is PROOF OF PERFORMANCE



Many hundreds of vessels in the Navy and Merchant Marine are equipped with the Fawick Clutch.



FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. Cleveland 11, Ohio
In Canada, Renold-Coventry Ltd., Montreal, Toronto, Vancouver
In Britain, Crofts Engineers, Ltd., Bradford, England

FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR

See No Relief From Short Paper Supply

Midwest Market Opinion Indicates No Expectation of Larger Civilian Paper Supply In Fourth Quarter — Plan New Salvage Drive — Truckers See Tire Crisis — Other Late Market News.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., July 31, 1944—With third quarter quotas or allocations all set and with mill representatives busily engaged in making fourth quarter applications for pulp, the picture in the Chicago area continues to be dark as far as civilian requirements are concerned. Reports indicate that even more paper is being asked of the military and the end-use program itself becomes, in the words of one sales representative, "almost useless" in the face of consumer demand.

Representatives of the kraft paper industry had little or no comment to make as conditions continued abnormally tight. Groundwood and newsprint representatives were in about the same position while jobbers and mill representatives of board and container papers were grimly hoping that new price ceilings would bring the expected increase in waste paper. Books and covers were increasingly tight, according to reports, as industry itself prepared for Fall business programs, with particular emphasis on non-rationed and less scarce merchandise.

Plan New Salvage Drive

During the past week the Waste Trade and Waste Material Dealers Association held a meeting to prepare for another paper salvage drive for the Chicago metropolitan area to be held on August 12. According to Albert Meisterheim, waste paper broker and member of Chicago's Salvage Committee, an appreciable sum of money has been appropriated for radio promotion and that, plus plenty of newspaper publicity, is expected to completely overcome the apathy which resulted in the failure of the last drive.

Under the new OPA ceilings, Mr. Meisterheim is reported to have pointed out, waste paper dealers are going to have a chance to make a profit. "Taking into consideration the beating dealers took in the last drive," he said, "it was decided that dealers can pay $10 for paper in this one. They can sell it for $15 loose and for $20 if baled. For this drive dealers can pay $5 to school janitor-peddlers."

In spite of the increases of $5 a ton in some instances, the revisions and the accompanying packaging regulations brought some confusion in this territory. Particularly did this seem to be true among some smaller dealers who were waiting for hoped for changes that would be helpful to smaller bale shippers. Consuming mills, in general, were reported to be fairly well pleased with the OPA order and indicated their belief that it was the answer to the statement that higher ceiling prices would materially expedite the collection of waste paper by professional collectors.

The drive itself was expected to have behind it the full force of publicity directed by John Robinson and the very effective Chicago Newspapers Salvage Committee and had the active cooperation of all civic groups and of the city administration itself. Outlying suburban areas were being counted on to work with the city in swelling the total of collections on August 12.

Plan Final Golf Outing

The western division of the Salesmen's Association of the Paper Industry will hold its second and final golf outing of the year at the Knollwood Country Club, on Friday, August 18. The June outing drew an exceptionally good crowd and chairman Lou Ellis of the Northwest Paper Company is making plans for the biggest turnout yet for the grand wind-up. The Fall outing, always held in conjunction with the Chicago meetings of the National Paper Trade Association and allied groups, will, of course, be eliminated this year because of the fact that NPTA will hold only smaller regional meetings out of deference to the wishes of the Office of Defense Transportation. Meanwhile, the SAPEYES will hold their regular Monday noon luncheon meetings at the Hotel Sherman all during the summer months.

Allied Trade Leader Dies

A prominent member of an allied industry, R. K. Hoover, vice-president of Charles N. Stevens Company, suppliers of paper and printing machinery, died earlier this month with funeral services attended by many of the friends Mr. Hoover had made as president of the Printers' Supply Salesmen's Guild of Chicago and later as head of the International Printing Supply Salesmen's Guild. Representatives of the paper and converting trade in this area, with whom Mr. Hoover was well acquainted, were also in attendance at the funeral.

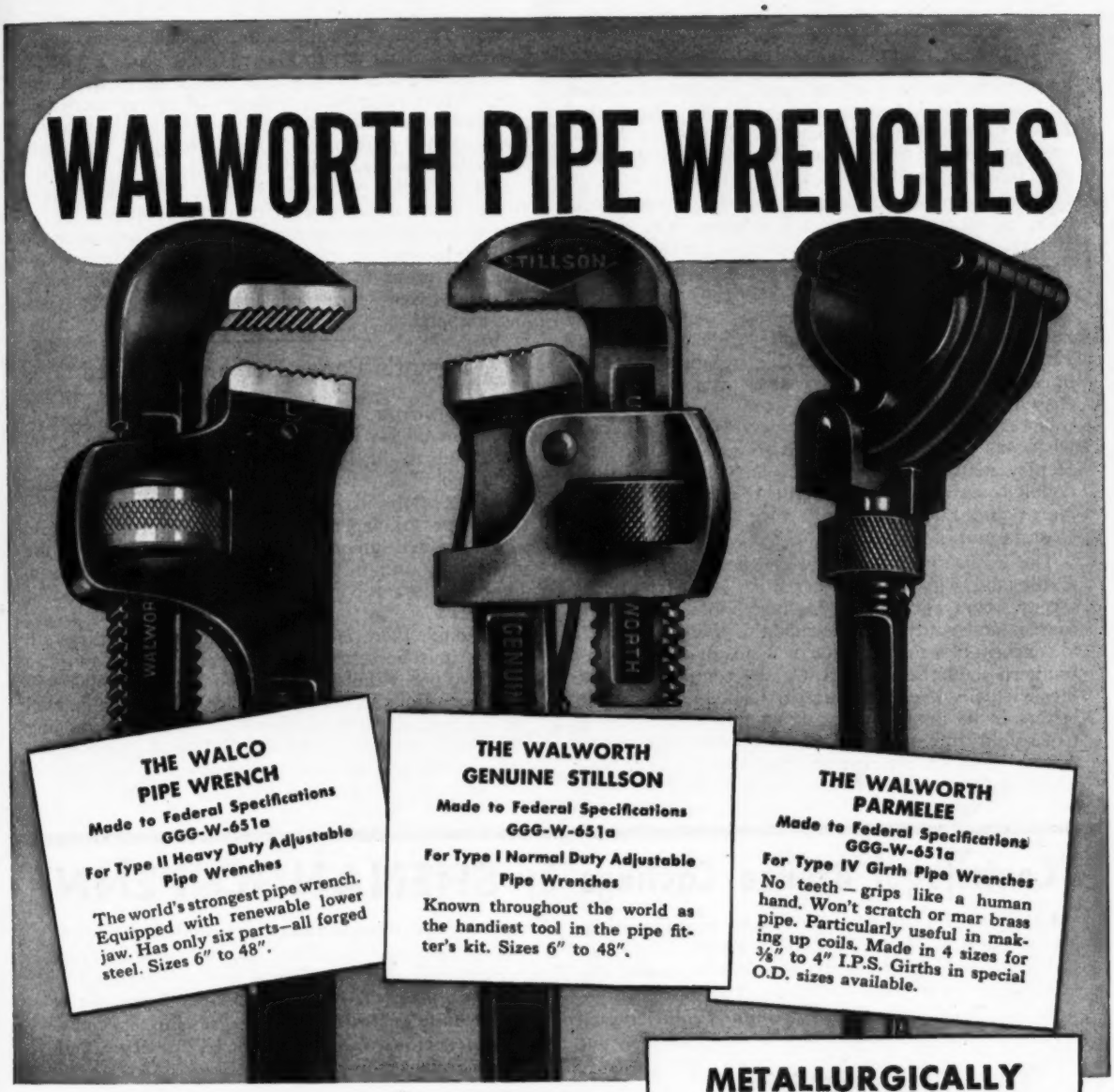
Truckers See Tire Crisis

That part of the trucking industry on which the paper trade has come to depend, is having its troubles with the tire situation. Both truck operators and users met in Chicago this week to fashion demands of the Federal government for some lessening of the tight truck tire situation to avoid at least a fifty per cent breakdown. Interest at the meeting centered around a report of a survey made by the Central Motor Freight Association which shows that 64 motor carriers operating over 10,000 vehicle units, most of them without spare tire, have been issued 3895 certificates for tires which are now unavailable locally. The entire problem will be outlined to the proper Federal authorities in an attempt to avoid what now looks like a serious transportation shortage which could have bad effects on the paper trade.

Tribune Boosts Pulp Salvage Output

The Chicago Tribune this week announced an increase in the rate of alcohol yield now salvaged from the brown sulphite liquor by-product of their wood pulp mills in Canada. The newspaper also stated that the by-product has grown into such substantial proportions that it "can compete in the post-war market with natural rubber." The increased efficiency demonstrated at the Thorold, Ontario mills, is said to be capable of enlarging the potential alcohol yield from pulp mills if the WPB "were to permit its further use by the wood pulp industry." Its use by

WALWORTH PIPE WRENCHES



THE WALCO PIPE WRENCH

Made to Federal Specifications GGG-W-651a

For Type II Heavy Duty Adjustable Pipe Wrenches

The world's strongest pipe wrench. Equipped with renewable lower jaw. Has only six parts—all forged steel. Sizes 6" to 48".

THE WALWORTH GENUINE STILLSON

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For Type I Normal Duty Adjustable Pipe Wrenches

Known throughout the world as the handiest tool in the pipe fitter's kit. Sizes 6" to 48".

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No teeth — grips like a human hand. Won't scratch or mar brass pipe. Particularly useful in making up coils. Made in 4 sizes for ⅜" to 4" I.P.S. Girths in special O.D. sizes available.

These three types of pipe wrenches are manufactured by the Walworth Company, and are noted for their safety, strength, and simplicity of operation.

Walworth, with more than a century of "know-how," also manufactures a complete line of valves, fittings, and pipe. For details see your Walworth distributor, or write on your company letterhead for free copy of Catalog 42.

METALLURGICALLY MODERNIZED

The most advanced metallurgical procedures are employed in the manufacture of Walworth Pipe Wrenches. Forging, heat-treating, and machining operations are performed with modern production equipment under strict supervision. In this way Walworth maintains the high standards of quality that have made Walworth pipe wrenches famous throughout the world.

WALWORTH

valves AND fittings

BOSTON WORKS
KEWANEE WORKS

60 EAST 42nd ST., NEW YORK 17, N.Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Now Henley Paper Co.

HIGH POINT, N. C., July 31, 1944—A. B. Henley, known for years in southern paper distribution circles, and since 1932 owning and operating the Parker Paper Company, High Point, N. C., announces that effective July 18 the name of the corporation becomes the Henley Paper Company.

This step involves no change in management. However, as supply conditions are relieved, Mr. Henley and his associates expect to put into effect a variety of new plans in selling policy and methods of distribution.

Known in southern territory as "the oldest paper house between Baltimore and Atlanta," the new Henley company has materially expanded both its lines and operating territory since Mr. Henley purchased the Parker Paper Company in 1932. Parker was established in 1906 and traveled salesmen over what was regarded as an extensive area. Under the Henley management this area has been more than doubled and company salesmen intensively travel North and South Carolina, Virginia, and parts of Georgia and Tennessee.

The company's location in the heart of Southern textile and woodworking territory led Mr. Henley several years ago to analyze merchandise lines and sources and readjust the company's line of products to conform best to the major demands of the foremost southern industries. Currently the company distributes virtually every product in its field required by buyers in its area, ranging from fine and industrial papers, to jute webbing, rope, twines and sewing thread. And on its regular customer list is a wide variety of diversified industries, including the large textile, furniture, printing and publishing, and dairy industries of its territory.

In making announcement of the change of the name, Mr. Henley referred to widespread survey work and analysis which the company has been conducting for more than a year past. "On the basis of our study of industries, individual companies and preferred paper and allied products," he said, "we look forward to the postwar years with tremendous optimism. In this recent and present market status of over-demand and under-supply, we have been able to utilize our time and effort in ways which will be productive of even improved service when supplies once again are more liberal."

Egypt's Paper Demand Limited

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944—There is little demand for paper and paper products in Egypt. According to the 1937 census, only about 16 percent of the population was literate, and since the standard of living of the majority is very low, the market for those types of paper, used where modernization and sanitation are important factors, is restricted to the needs of a minute portion of the total population, according to a report received at the Department of Commerce.

Although there is some manufacturing activity in Egypt, it is necessarily on a small scale. There are only two paper mills of any importance (another will start operations in the near future) and three manual factories all of which confine their output to wrapping paper and inferior grades of cardboard using Egyptian rice straw and waste paper as raw materials.

Wood pulp is imported in limited quantities.

Centrifugal Bronze Castings by SHENANGO-PENN

● Centrifugal casting is a process that assures castings of uniform density and greater strength . . . castings that deliver long trouble-free service. As practised by Shenango-Penn, the castings are of highest quality—they can be relied upon for exacting and uninterrupted performance. For contractors in war industries our complete machining facilities are an added advantage.

Many types of rolls, rollers and roll cover castings are specialties. Proper finish and tolerances for shrink or press fits—straight or taper bores. Write for free bulletin No. 143, which gives alloy specifications, describes our products and facilities, and contains other valuable data.

ALL BRONZES • MONEL METAL • ALLOY IRONS

Rolls • Bearings • Bushings
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Executive Offices: Pittsburgh, Pa.

PAPER

17 million tons* of it!

GENERAL CHEMICAL COMPANY *products for the Paper Industry.*

Aluminum Sulfate (*Standard and Iron Free*) • **Sodium Silicate**
Zinc Chloride Solution • **Glauber's Salt** (*Crystal or Anhydrous*)
Sodium Sulfide • **Sodium Bisulfite** (*Solution or Anhydrous*)
Crystal Alum, Potassium • **Salt Cake** • **Trisodium Phosphate**
Sodium Metasilicate • **Sodium Hyposulfite** • **Muriatic Acid**
Sodium Sulfite Anhydrous • **Sodium Aluminum Sulfate**
Epsom Salt • **Nitre Cake** • **Sulfuric Acid**

GENERAL CHEMICAL COMPANY

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Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) • Buffalo Charlotte (N. C.) • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City • Milwaukee Minneapolis • New York • Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis • Utica (N. Y.)

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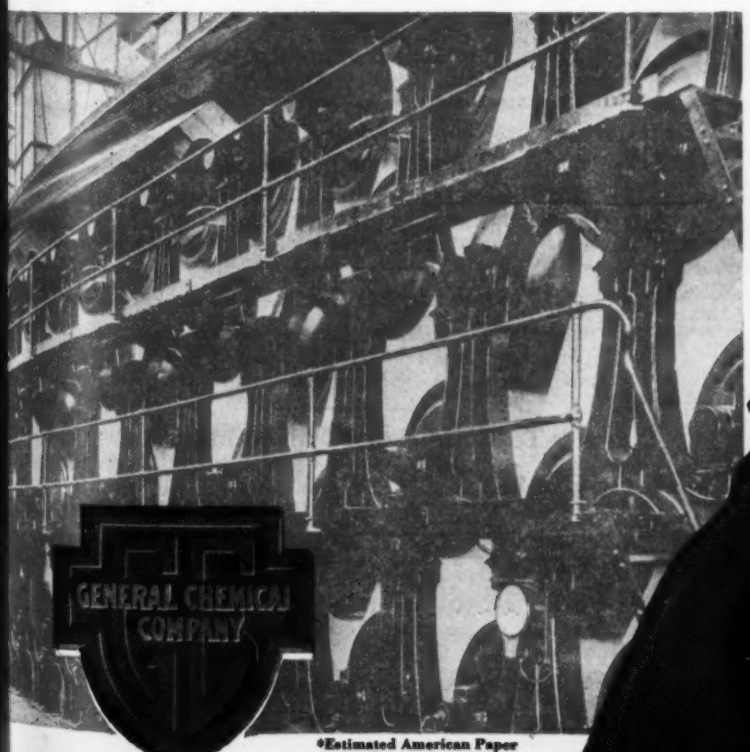
Los Angeles • San Francisco • Seattle, Wenatchee and Yakima (Wash.)

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



*Estimated American Paper Production for 1943

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending July 29, 1944

STOCKS

	High	Low	Last
A. P. W.	3⅝	3½	3⅝
Armstrong Cork Co.	43⅞	42	42½
Celotex Corp.	14¼	13⅝	14¼
Celotex Corp., pf.	18¾	18	18¾
Certain-Teed Products Corp.	7¼	6½	6⅞
Certain-Teed Products Corp., pf.	98	92	95⅞
Champion Paper & Fibre Co.	27	26½	26½
Champion Paper & Fibre Co., pf.	113	112½	112½
Congoleum Nairn Co.	26⅜	26	26
Container Corp. of America	26¼	25⅜	25½
Continental-Diamond Fibre Co.	12	11½	11¾
Crown-Zellerbach Co.	18⅞	18⅛	18¾
Crown-Zellerbach Co., pf.	102¼	101⅜	101⅜
Dixie Cup Co.	18	17½	17½
Dixie Cup Co., -A.	46½	46	46½
Flintkote Co.	23⅞	23⅛	23½
Flintkote Co., pf.	...	...	...
Robert Gair	4⅞	4½	4¾
Robert Gair, pf.	16⅜	16	16⅜
International Paper Co.	18⅜	17¾	18
International Paper Co., pf.	83⅜	82¾	83
Johns-Manville Corp.	95¼	94	95¼
Johns-Manville Corp., pf.	...	...	...
Kimberly-Clark Corp.	40½	38½	40
MacAndrews & Forbes	29⅞	29½	29½
MacAndrews & Forbes, pf.	...	...	...
Masonite Corp.	44¼	43	44¼
Mead Corp.	11¾	10½	11
Mead Corp., pf. A-6%	...	...	...
Mead Corp., pf. B 5½	87	87	87
National Container Corp.	23	21	21½
Paraffine Companies, Inc.	56	54	54
Paraffine Companies, Inc., pf.	...	...	...
Rayonier, Inc.	15⅞	15½	15½
Rayonier, Inc., pf.	33½	32	32
Ruberoid Co.	33	31⅝	31⅝
Scott Paper Co.	42½	42	42¼
Scott Paper Co., pf.	109	109	109
Sutherland Paper Co.	33	33	33
Union Bag & Paper Corp.	12	11⅝	11¾
United Paper board Co.	6	5⅞	5⅞
U. S. Gypsum Co.	79¾	79¼	79½
U. S. Gypsum Co., pf.	180	180	180
West Virginia Pulp & Paper Co.	26¼	25⅝	25⅝
West Virginia Pulp & Paper Co., pf.	106½	106½	106½

BONDS

Abitibi Pulp & Paper Co. 5s '53	83¾	82½	83⅛
Celotex Corp. 3¾s '55	103¾	103⅛	103⅛
Certain-Teed Products Corp. 5½s '48	101¾	101½	101¾
Champion Paper & Fibre Co. 4¾s '50	...	...	...
International Paper Co. 6s '55	108	107½	107½
International Paper Co. 5s '47	104¼	104¼	104¼
Mead Corp. 3½s '53	...	...	...
West Virginia Pulp & Paper Co. 3s '54	...	...	...

New York Curb Exchange

High, Low and Last for Week Ending July 29, 1944

STOCKS

	High	Low	Last
Great Northern Paper Co.	34¾	34¾	34¾
Hummel-Ross Fibre Corp.	6¾	6¼	6½
St. Regis Paper Co.	6¼	5⅝	6
St. Regis Paper Co., pf.	...	...	...
Taggart Corp.	6	5¾	5⅞

BONDS

American Writing Paper Co. 6s '61	101¼	100½	100½

Scott Co. Profits Lower

The Scott Paper Company for the six months to July 1 reports consolidated net earnings, after provision for preferred dividends, of $645,747, or 96 cents a common share, against $665,247, or 99 cents a share, last year.

Filer Fibre Co. Profits Up

The Filer Fibre Company for the year to May 31 reports a net income of $68,798, or 52 cents a share, against $54,542, or 41 cents a share, for preceding fiscal year; net sales, $2,174,731, against $1,930,263.

Hinde & Dauch Earn $1.43

The Hinde & Dauch Paper Company for the six months reports a net profit, subject to renegotiation, of $605,287, or $1.43 a common share, against $597,193, or $1.41 a common share last year.

Gair Co. Profits Off

The Robt. Gair Company, Inc., and subsidiaries for the six months to June 30 reports a net profit of $218,484, equal to 19 cents each on 1,133,822 shares of common stock, compared with $302,574, or 26 cents a share in the corresponding six months of last year. June quarter: Net profit, $140,811, equal to 12 cents a share, compared with $260,211, or 18 cents a share in the same quarter of 1943

At a meeting of the Board of directors, held on July 25, 1944, a quarterly dividend (No. 15) of thirty cents (30c) per share in respect of the third quarter of the year 1944 was declared upon the Preferred Stock of the par value of $20 per share of the Company, payable September 30, 1944 to stockholders of record at the close of business September 14, 1944, without the closing of the transfer books.

Champion Earns $2.57

The Champion Paper and Fibre Company and subsidiaries for the year to April 30 reports consolidated net income of $1,970,527 or $2.57 a common share, compared with $2,532,213, or $3.63 a common share, for previous fiscal year. Net sales increased approximately $3,085,000 to $46,249,013 from the preceding fiscal year.

United Paperboard Nets $11.56

The United Paperboard Company for the year to May 31, reports a net profit of $98,983, equal to $11.56 a share on the preferred stock, compared with $37,453, or $4.29 a share in the year to May 31, 1943.

M. & O. Earns 607.41

The Minnesota and Ontario Paper Company reports consolidated net income for the six months ended June 20, 1944, was $607,741, compared with $722,026 for the six months of 1943.

Keyes Fibre Earns Less

The Keyes Fibre Company for the six months reports a net income of $155,510 compared with $150,909 last year.

Tomahawk Earns More

The Tomahawk Kraft Paper Company for the year to May 31 reports a net income of $182,487, compared with $135,601 in the previous fiscal year.

Whitaker Nets $3.96

The Whitaker Paper Company for the six months reports a net income of $132,585, or 3.96 a common share, against $163,582, or $454 a share, last year.

To Build Paper Mill in Madrid

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944—The Spanish Government has recently awarded a contract to a Swiss firm of contractors for the construction of a paper mill in Madrid, according to a report to the Department of Commerce. This new enterprise, it is reported, is being launched for the sole purpose of manufacturing currency, certificate and special document papers.

Import Newsprint for Wrapping

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944—Although imports of newsprint into Honduras during the period 1938-39 to 1941-42 increased by about 20 percent, this should not be taken as an indication of increased publishing activity, according to a report to the Department of Commerce. In reality the major portion of this increase was a direct result of the additional use of newsprint in many parts of the country as a wrapping paper for merchandise, especially foodstuffs. This is further brought out by the fact that the almost 50 percent reduction in newsprint imports during the past two years has not affected the publishing industry in any way.

There is no pulp or paper production in Honduras and since only a very few products are packaged locally—primarily coffee and cigarettes—there is no production of converted paper products. Paper bags, paperboard containers and toilet paper are the only converted paper products which Honduras imports in regular quantities.

Com. Madden in Marshall Islands

BOSTON, Mass., July 31, 1944—Commander Alphonsus L. Madden, of the Navy, formerly sales representative for Carter, Rice & Co., Corporation is now somewhere in the Marshall Islands. He is in charge of important work in connection with the bases seized by the United States Forces. Commander Madden, who was the first from Carter, Rice to go into the service, was formerly in the Naval Reserve and was a lieutenant commander when he left Boston.

Newspapers Use Less Newsprint

Daily newspapers continue to make big cuts in the consumption of newsprint paper.

Daily newspapers reporting to the American Newspaper Publishers Association consumed 191,077 tons of newsprint paper in June 1944 compared with 228,450 tons in 1943 and 242,404 tons in 1941. This was a decrease in June 1944 under June 1943 of 16.4% and a decrease under June 1941 of 21.2%.

The total estimated newsprint consumption in the United States for June 1944 was 254,769 tons which includes all kinds of uses of newsprint paper. For the first six months of 1944, it was estimated to be 1,558,033 tons.

During the first six months of 1944 the reporting newspapers used 1,168,525 tons of newsprint, a decrease of 16.1% under the first six months of 1943, and a decrease of 20.4% under the first six months of 1941.

The stocks of newsprint paper on hand with newspapers reporting to the ANPA was 54 days' supply at the end of June 1944 which was an increase of 3 days' supply from 51 days on hand at the end of May 1944.

H. W. Hilliard Co. Gets Certificate

The Virginia State Corporation Commission has issued a Certificate of Authority to H. W. Hilliard Company, Inc., Richmond, Va., to do an envelope and printing business. The firm has a maximum capital of $50,000 and M. S. Rackett is the agent in charge.

No Off-Weight Papers with Accurate Stock Control

Appleton Consistency Regulators can be used any place where weights must be maintained within narrow limits ● Will regulate at less than 1% up to whatever density can be pumped ● Are equally effective on rag or sulphite, kraft, glassine, groundwood, etc. ● Work equally well on filled or unfilled papers ● Regulate before measuring variations, holding hunting to a minimum. Improve and stabilize paper machine operations ● Guarantee uniform consistency ● The Appleton Consistency Regulator gives clean, accurate, uninterrupted service with little attention ● There is nothing to get out of order even with the passage of foreign materials in the stock ● Non-corrosive materials are used throughout ● Controls are outside the box, eliminating any chance for operating difficulties ● Thoroughly tested and proven in mill operation for years.

This folder describes the construction and operation of the Appleton Consistency Regulator. It is simple in design, easy to operate. There are no complicated controls or attachments, no floats, paddles or propellers. Any variation in density automatically increases or decreases to water input, correcting the proportions. This accurate furnish control is essential in maintaining production of uniform weight papers. Write for your copy.

THE APPLETON MACHINE COMPANY
APPLETON WISCONSIN

Eastern Sales Representatives, CASTLE & OVERTON, Inc. 630 Fifth Avenue, New York

R. F. Berkeley, Jr. Promoted

The appointment of Richard F. Berkeley Jr. to the position of sales manager, Printing Paper Department of Blake, Moffitt & Towne's San Francisco Division, has just been announced to customers and friends of the West's pioneer firm of paper distributors. "Dick," as he is known to his many friends in the trade, succeeds H. P. Westler who has been with the company since 1924 and in recent years its sales manager. Mr. Westler has resigned to accept a position as a mill representative for a large paper manufacturer and takes with him the good wishes of his former associates for continued success.

Mr. Berkeley entered Blake, Moffitt & Towne in 1923, coming from his home in Richmond, Va. He received his first training in paper on the city sales desk, following which he handled the sales promotion of announcements and other paper specialties. He is well known in advertising circles and for many years has been a member of the San Francisco Advertising Club. With an experience of over 20 years in the sale of printing papers in San Francisco, he possesses a thorough knowledge of the requirements of the trade and of market conditions in the paper industry.

Coupled with this announcement covering the Printing Paper Department is the news that Frank L. Unthank, well known to the trade and who has had many years of experience in merchandising Blake, Moffitt & Towne papers, will become sales manager of the Company's Mill Department. This branch of the business has charge of the large contract and converter accounts which require special attention and contact between customer and mill sources of supply.

To Continued $4 Price Differential

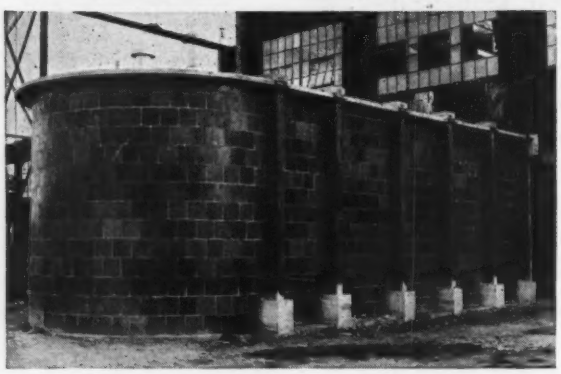
WASHINGTON, August 1, 1944 — A temporary differential of $4 a ton, allowed for the last four months on sales of lightweight newsprint paper manufactured outside the continental United States, was continued in effect today by the Office of Price Administration. The same differential is permitted, without an expiration date, on sales of lightweight newsprint made in the United States.

The time limit for the differential on the Canadian product originally was fixed to give producers a chance to study whether the amount allowed is equitable, OPA said, and to permit manufacturers to submit cost and other data in event another figure was sought. Wartime Prices and Trade Board of Canada recommended recently that the $4 figure be retained.

New WHS Speed Reducer Catalog

Many things you may want to know about speed reducers are contained in the new 92 page Catalog and Engineering Manual No. 144 recently published by Winfield H. Smith, Inc., Springville, Erie County, N. Y. It approaches the authority and completeness of a textbook and includes the answers to questions you might ask about speed reducer design, ratio range, horsepower, and torque ratings. It gives helpful information on selecting your reducer, construction, overhung loads, lubrication, chain-pull factors, flexible couplings. It includes an especially valuable and complete engineering section containing many widely used formulae, tables and charts. To obtain a copy, address the manufacturer on your business letterhead, stating your position.

You Paper Mill Men • *take a Tip on Kalamazoo Tile Stock Tanks and Chests* • *you can't beat them for* **STRENGTH** *and* **DURABILITY** •



Kalamazoo Vitrified Glazed Tile

is a "Natural" for Paper Mill Needs—

Smooth, hard, strong, easily cleaned and highly resistant to chemical action, this marvelous vitrified glazed tile type of construction is preferred by scores of leading paper mill executives and engineers. Adaptable for stock tanks and chests of all kinds. Costs no more than concrete tanks that require constant maintenance expense.

An exclusive method of glazed tile tank construction developed by Kalamazoo engineers. It provides greater flexibility and lower cost for all paper mill stock handling problems. Immediately available.

● **Any Size or Shape Desired—**

Wide, narrow—shallow or deep. Round, rectangular or square. Half-round or tapered bottom and corners. Midfeathers and fins where needed to control stock flow. Adaptable to pumps or agitators. Construction individually designed to meet space, tonnage or production requirements.

Ask for engineering data.

Kalamazoo TANK & SILO CO.
KALAMAZOO - MICHIGAN

Obituary

Edgar Hiel Bristol

Edgar H. Bristol, president of The Foxboro Company, Foxboro, Mass., and one of its founders, died unexpectedly of a heart attack, on July 24, at his summer home at Falmouth Heights, Mass.

Mr. Bristol was born in Naugatuck, Conn., March 7, 1871. He had unusual mechanical skill, and after completing his high school education he found employment as a machinist, later becoming a tool-maker and subsequently production manager of the instrument company of which his father was president. With his brother, Bennet B. Bristol, he withdrew in 1908 to organize the Industrial Instrument Company which, on January 1, 1914, became The Foxboro Company. Mr. Bristol maintained an active participation in the company's affairs, serving as its president throughout its history. He was also the president of the Foxboro National Bank.

More than forty patents were recorded to his credit, some of them so basic in character as to establish new principles of instrument design and operation. The helical spring, which is the measuring element in temperature and pressure recorders, is an example of his inventive genius.

He is survived by his widow, a son, Benjamin H. Bristol, four daughters and sixteen grandchildren. Funeral services were held at Bethany Congregational Church, Foxboro, Mass., on July 26.

Frank W. McQueeney

Frank W. McQueeney, 61, of 1116 Newell place, Kalamazoo, Mich., safety and athletic director for the Sutherland Paper Company whose baseball team has won the city championship the last five consecutive years, died suddenly of a heart attack on July 20.

Mr. McQueeney was popular in Kalamazoo sports circles. As athletic director for the Sutherland Paper Company the last three years he had organized a strong, well-rounded sports program for that company which included teams in baseball, basketball, bowling, softball and golf. Through his efforts the inter-plant recreational program was started.

From the Bryant Paper Company Mr. McQueeney went to Sutherland in April, 1934, as receiving clerk for the Standard board mill. In 1935 he was made personnel manager and in June, 1941, he assumed the safety and athletic directorship. In that capacity he had established an outstanding record for safety in all plants of the company, his associates say.

He is survived by his wife, Jennie DenAdel McQueeney; two daughters, Miss Lois McQueeney and Mrs. Robert DeZwarte of Kalamazoo.

William E. Sheehan

William E. Sheehan, for 46 years with Albany Felt Company, Albany, N. Y., died at Goshen, N. Y., on July 20. Mr. Sheehan was retired in 1939, but he represented the Albany Felt Company in the East for over 40 years and was well known throughout the paper industry.

C. Walter Dearden

C. Walter Dearden, 64, treasurer and manager of the Butler-Dearden Paper Service, Inc., Worcester, Mass., died July 15 at the Worcester Memorial Hospital after a short illness. Mr. Dearden, who lived at 98 Lake Avenue, Leicester, Mass., was a director of the New England Paper Merchants Association, past-president of the Springfield Advertising Club, a member of the Worcester Advertising Club, and a Shriner. His mother and three daughters are living.

The funeral service was held at the Federated Church, Leicester, with burial in Paucatuck Cemetery, West Springfield.

Quincy P. Emery

Quincy Pierce Emery, president of the Stevens-Nelson Paper Company of New York, died July 20 at his home in Old Greenwich, Conn. His age was 60. He was a graduate of Massachusetts Institute of Technology and Columbia University.

A resident of Greenwich for twenty years, Mr. Emery held directorships in the Advertising Club of New York, the American Institute of Graphic Arts and the New York Club of Printing House Craftsmen. He was also treasurer of the Perrot Memorial Library in Old Greenwich.

W. Elliott Simpson

HUDSON FALLS, N. Y., July 31, 1944—W. Elliott Simpson, assistant treasurer and secretary of the Sandy Hill Iron and Brass Works, died last week following a brief illness. He was 67 years old. He had been connected with the concern for about 25 years and was widely known in this section. He came to the local firm from the Thomson mill of the United Paperboard Company. The principal survivors are a son, daughter and two brothers.

Rules on Mimeograph Papers

WASHINGTON, D. C., August 2, 1944—New manufacturers ceiling prices that became effective June 21, 1944, on 16-pound chemical woodpulp mimeograph paper, apply only to mimeograph papers and not to any of the related grades referred to in the writing and fine paper regulation, the Office of Price Administration said today.

The related grades that were not affected include but are not limited to spirit and gelatin duplicator, multilith and other duplicating papers.

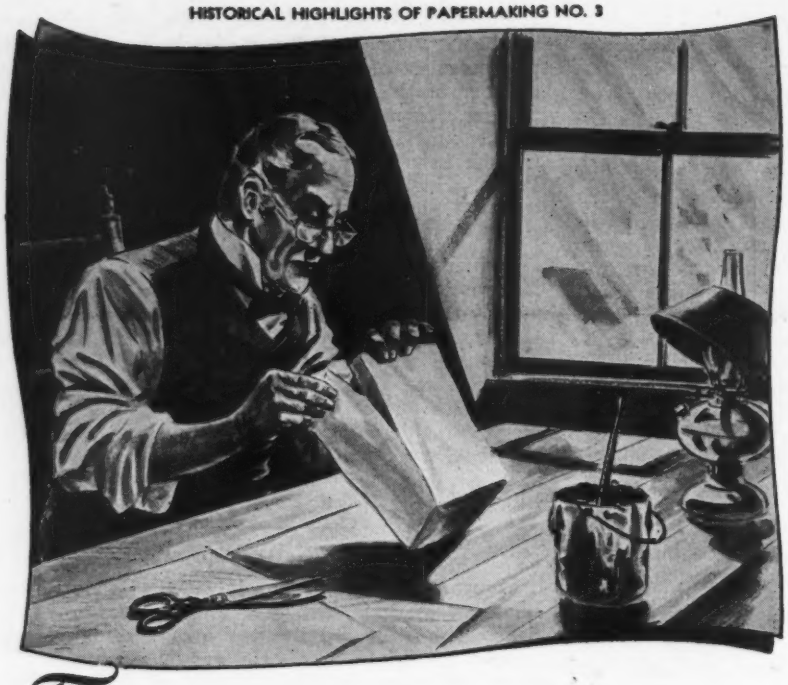
The June 21 ceilings, which specifically apply to the three grades of chemical woodpulp mimeograph paper, also apply, however, to any related grades that are commonly recognized by the trade as chemical woodpulp mimeograph paper.

OPA pointed out that the conditions that necessitated an increase in ceilings of mimeograph paper in June do not exist in the case of duplicating papers and similar related grades, and hence the latter do not qualify for the new ceilings.

New York-Canadian Div. To Meet

The New York-Canadian Division of the American Pulp and Paper Mill Superintendents Association has decided to hold its fall meeting at the Welland House in St. Catharines on September 1 and 2. This will be a meeting with the Empire State Section of the Technical Association of the Pulp and Paper Industry and the Niagara District Technical Section of the Canadian Technical Association as guests of the association. H. E. Karberg, chairman of the division has appointed an efficient committee who are working upon plans to make the meeting an unusual success. from the view point of attendance, recreation and education.

HISTORICAL HIGHLIGHTS OF PAPERMAKING NO. 3



Fifty Billion Paper Bags

In 1850 an enterprising American, whose name has been lost in history, made the first paper bag entirely by hand. Twenty-six years later the first automatic paper bag machine was invented. Today, over fifty billion paper bags are used in the United States!

Little did this unknown dream of the widespread future use of his invention. Grubby, little-boy hands clench a paper bag, of candy. Great flour mills pour their product into paper bags. Every housewife carries home hundreds every year. Today, the paper bag is a necessity.

Before the commercial production of paper bags was started Cheney Bigelow was supplying mills with essential equipment. This equipment helped pioneer the papermaking industry in America.

☆ ☆ ☆ ☆

More than 100 years of experience go into our daily work of meeting the Industry's needs for wire cloth, cylinders, dandys and Fourdrinier wires. At the same time, we have been able to expand our plant facilities to include war products, with such success that it won us the Army-Navy "E."

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Fourdrinier Wires • • Dandys • • Cylinders • • Wire Cloth

CHENEY BIGELOW WIRE WORKS · 417 LIBERTY STREET · SPRINGFIELD, MASS.

Contracts are Awarded for Government Paper

WASHINGTON, D. C., August 2, 1944—Eastern Corporation will furnish 100,000 pounds of white bond papers at 11.46 cents for paper purchased for the Government Printing Office on the open market. Other awards recently announced include the following:

Eastern Corporation will furnish 50,000 pounds of white bond paper at 11.46 cents and 364,500 pounds of white book paper will be furnished at 8.9 cents by Walker Goulard Plehn Company. D. L. Ward Company will furnish 37,375 pounds of blue bond paper will be furnished at 10.03 cents and Groveton Papers will furnish 9,660 pounds of white bond paper at 7.95 cents.

Northwest Paper Company will furnish 50,000 pounds of government post card paper at 7.61 cents and the same company will furnish 50,000 pounds same at 6.84 cents. Walker Goulard Plehn Company will furnish 250,000 pounds of white G. W. writing paper at 16.11 cents. Barton Duer & Koch Paper Company will furnish 50,200 pounds of white cover stock at 10.40 cents. Central Ohio Paper Company will furnish 40,000 pounds of white paper at 14.89 cents and the same firm will furnish 30,000 pounds of same yellow at 15.617 cents, 10,000 pounds same green at 15.617 cents and 10,000 pounds blue at 15.617 cents.

Walker Goulard Plehn Company will furnish 6,480 pounds of white vegetable parchment at 18.65 cents and R. P. Andrews Paper Company will furnish 554,470 pounds of white paper at 7.61 cents and Marquette Paper Company will furnish 77,000 pounds of white book paper at 7.49 cents. Cauthorne Paper Company will furnish 2,500 pounds of red stero paper at 12 cents. Zellerbach Paper Company will furnish 400,000 pounds of white writing paper at 8.63 cents.

Willcox Walter Furlong Paper Company will furnish 259,500 pounds of white book paper at 7.24 cents and Paper Corp. of U. S. will furnish 148,000 pounds of tan bristol paper at 9.9 cents. Mudge Paper Company will furnish 5,590 pounds of white mfg. paper and 83,580 pounds of canary mfg. paper at 9.25 and 10.25 cents.

Central Ohio Paper Company will furnish 30,000 pounds of white offset paper at 7.58 cents and the same firm will also furnish 15,000 pounds of same at 7.58 cents. Mudge Paper Company will furnish 10,000 pounds of white ledger paper at 16.39 cents

and the Mead Sales Company will furnish 55,055 pounds of white M. C. paper at 7.13 cents and 79,000 pounds of machine coated paper will be furnished by Barton, Duer & Koch Paper Company at 7.04 cents. The same firm will also furnish 79,000 pounds of same at the same price. Central Ohio Paper Company will furnish 100,000 pounds of book paper at 7.69 cents and the Paper Corp. of U. S. will furnish 59,200 pounds of manila tag board at 8.75 cents. R. P. Andrews Paper Company will furnish 400,000 pounds of U. S. postal card bristol at 6.17 cents. Eastern Corp. will furnish 50,000 pounds of white ditto paper at 8.63 cents. Graham Paper Company will furnish 30,000 pounds of white, canary and pink mfg. paper at 9.3 cents, 10.4 cents and 10.4 cents.

Wilcox - Walter Furlong Paper Company will furnish 100,000 pounds of white writing paper at 7.98 cents and Walker Goulard Plehn Company will furnish 135,000 pounds of stock for gumming at 7.04 cents. Mead Sales Company will furnish 30,000 pounds of white writing paper at 7.70 cents and 20,000 pounds of same yellow at 8.43 cents. Central Ohio Paper Company will furnish 100,000 pounds of white book paper at 7.58 cents and the same firm will furnish 46,000 pounds of offset book paper at 7.58 cents. Nashua Gummed & Coated Paper Company will furnish 200,000 sheets of white gummed paper at $14.70 per M sheets. Central Ohio Paper Company will furnish 246,000 pounds of book paper at 7.69 cents, and R. P. Andrews Paper Company will furnish 14,400 pounds of Riegel Tufwite tag paper at 9.75 cents. Mead Sales Company will furnish 298,800 pounds of white M. C. paper at 7.79 cents.

Paper Mills of Argentine Fare Well

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944 — Argentine paper mills have fared well since the beginning of the war. Ample supplies of wood-pulp are being imported from Sweden and local production of wood-pulp has been increased, according to a report to the Department of Commerce at Washington, D. C.

During 1943 Argentina imported 160,000 short tons of paper as compared with 171,870 tons in 1942. The four-year average 1938-1941 was 224,415 tons.

Argentina imported 22,141 tons of paper, cardboard and manufactures valued at 15,080,000 pesos during the first three months of 1944.

American Pioneers

The first Light House in America was erected 1716 on Little Brewster Island at entrance to Boston Harbor. Partially destroyed in siege of Boston 1775 and rebuilt in 1783. Now called Boston Light.

Massachusetts has scored many "firsts" in American History. Boston Light for 228 years has faithfully warned and welcomed ships from the Seven Seas and guided the coastwise vessels. It was the first lighthouse in America, but since war was declared it has remained unlighted.

DRAPER BROTHERS COMPANY, while young as compared to Boston Light, was a pioneer in the manufacture of paper makers' felts in Massachusetts. We have survived three wars and will continue after this one with our lights and hopes undimmed.

Draper Felts For Efficiency

DRAPER BROTHERS COMPANY

Woolen Manufacturers Since 1856

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E. R. LELOFF, Vancouver, Wash.
WILLIAM N. CONNOR, Canton, Mass.

PAPER
TRADE JOURNAL
Title Reg. U. S. Pat. Off.
Henry J. Berger, Editor

COMING EVENTS IN PAPER INDUSTRY

New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Delaware Valley Section. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.

Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

Chicago Professional Paper Group—First Monday of each month except July and August at Chicago, Ill.

THE PAPER SITUATION

Paper output in the current third quarter is estimated to aggregate 2,026,000 tons, compared with 2,020,000 tons in the second quarter, and with 2,089,000 tons in the first quarter of 1944. The percentage distribution of sales by end user groups is as follows: Government, 14.9%; defense plants, 15.2%; communications, etc., 22.7%; agricultural, 14.1%; construction, 6.90%; manufacturers of civilian products, 10.3%; retail and household, 8.9%; and miscellaneous, 7.0%. Paper production, all grades, for the first five months of 1944 totaled 7,159,000 tons, which is 1% more than in the same period in 1943. Increased production this year over last year, reported by the Department of Commerce, was confined to five grades, as follows: shipping sack, 43.6%; special industrial, 20.7%; absorbent, 14.7%, and building paper, 4.7%. Paper board production in the five-months of 1944 totaled 3,705,000 tons, compared with 3,547,000 tons in 1943, or an increase of 4.5%. Increased output was reported for six types of paper board, as follows: tube stock, 80.7%; miscellaneous, 55.3%; container, 5.1%; cardboard, 3.7%; building, 1.8%, and folding box board, 0.70%.

The Department of Commerce reports that greatly increased war requirements forewarn further curtailment for civilian uses in the third quarter. Authorized minimum total paper and paper board production (machine basis) during the third quarter amounts to 4,342,000 tons, compared with 4,335,000 tons in the second quarter. The importance in a wartime economy of paper and paper board is disclosed in the percentage of sales by end user groups given above. The end use of paper primarily for war purposes will amount to close to 30% of the total production, while purchases of paper to maintain a war economy, such as for communications, health, agricultural products, etc., and in construction, will total about 43% of the output, the remainder of around 29% being required to maintain the civilian economy.

In commenting on the supply situation in groundwood printing and book papers, the Department states that no reduction has been made in authorized minimum book and groundwood papers for the third quarter, but the allocation of pulp was cut nearly 8%, partly because production of these papers in the first five months exceeded substantially the estimated output from pulp allocations. With still additional cuts necessary in grocery bag and wrapping papers and some other types of papers in terms of pulp allocation, it was considered necessary to reduce pulp allocations to book and groundwood printing papers to more closely conform to recommended minimum program determination requirements for these papers. More conservative use of printing papers will be required in the future.

Concerning fine paper output the report shows that the output of fine papers for the first five months of 1944 shows a reduction of 7% compared with the same period in 1943. In wrapping, bag and converting papers, the authorized minimum production of coarse papers in the current third quarter is 476,000 tons, or about the same as in the second quarter, but 20% less than in the first quarter of 1944. Production in May, the Department reports, showed a slight increase. Output of wrapping paper for May totaled 163,000 tons, compared with a monthly average of 164,000 tons during the first five months of this year and of 192,000 tons during 1943. The increased demand for sulphate pulp for non-paper use has been small to date, and has no important effect on the production of kraft paper. Production of bag paper, except shipping sack, totaled 29,000 tons in May, compared with 26,000 tons in April, 1944, and with a monthly average of 43,000 tons in 1943.

Shipping sack paper production for the first five months of 1944 aggregated 158,000 tons, a monthly average of 31,000 tons compared with production for May of 36,000 tons. Recommended minimum production for the third quarter is 99,000 tons or a monthly average of 33,000 tons. Consumption of shipping sack paper in 1943 amounted to 245,000 tons, compared with an estimated consumption of between 385,000 and 400,000 tons during the current year. The output of special industrial papers showed a rising trend in May, when output totaled 22,000 tons, compared with an average monthly production of 20,000 tons during the first five months of the current year. Output for April was 19,000 tons.

Pulp for container board production in the third quarter of the current year is estimated as follows: total, 1,123,000 tons, composed of the following grades: kraft liner, 407,000 tons; jute liner (including V-boxes), 326,800 tons; corrugating board, 280,000 tons; container chip, 78,300 tons and other container board, 30,500 tons. In reference to the distribution of container board the Department of Commerce points out that certain changes have been made by the WPB for the third quarter. Under the new method, no reserve has been withheld to take care of additional requests for container board, and "interim applications" for additional authorizations during the third quarter will not be accepted. Third

quarter authorizations are not restricted to the box manufacturers' normal sources of supply.

In commenting on wholesalers' sales and inventories, the Department states that the index of sales for May increased 10% over April, raising the index to 162.3, which was approximately the level prevailing in the past several months and about the same as in the second quarter of 1943. Current sales, however, are substantially higher than in 1942, 1941 and 1940, owing in part to higher prices which are reflected in a dollar sales index. The index of wholesalers' sales in paper and paper products for May, 1944, at 162.3, compares with 154.6 for the like months in 1943, with 140.8 in 1942, with 129.9 in 1941, and with 103.9 in 1940. The inventory index for May, 1944, the highest of this year, was 98.8, compared with 114.5 for 1943, with 131.1 for 1942, with 103.5 for 1941, and with 97.7 for 1940.

To Build Mills in French Indo China

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944—It is reported in German and Scandinavian newspapers that the Japanese Government plans to construct two large paper factories in French Indo China, according to a report to the Department of Commerce. The one will use timber as its primary raw material while the other will utilize such native materials as rushes and bamboo. At present there is only one paper factory in the entire area which supplies approximately one-ninth of the country's normal requirements.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1944		Corresponding Weeks—1943	
June 17	92.8	June 19	87.0
June 24	92.4	June 26	87.0
July 1	89.5	July 3	77.4
July 8 (Holiday July 4)	53.8	July 10	66.2
July 15	91.1	July 17	90.2
July 22	*91.3*	July 24	90.1

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1943	87.2	88.9	89.5	88.7	91.4	84.8	84.3	91.0	88.3	89.6	89.6	82.0	87.8
1944	89.6	89.6	90.1	89.5	90.9	*92.6*							

COMPARATIVE YEARLY SUMMARIES

	1937	1938	1939	1940	1941	1942	1943	1944
Year to Date	87.9	67.6	78.6	86.9	93.4	95.7	87.7	*89.1*
Year Average	79.8	71.5	83.4	85.6	97.4	90.4	87.8	

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS†

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1938	56	63	63	60	60	59	59	69	70	73	67	61	64
1939	65	73	76	74	69	73	68	77	82	91	88	77	77
1940	78	75	74	76	82	85	77	79	78	85	83	77	78
1941	81	88	89	89	91	94	92	98	95	99	98	90	92
1942	102	101	101	95	82	72	68	75	76	81	82	77	84
1943	86	88	94	94	96	94	89	96	94	94	93	87	93
1944	90	96	95	96	96	*96*							

Week ending June 17, 1944—95
Week ending June 24, 1944—96
Week ending July 1, 1944—95
Week ending July 8, 1944—60
Week ending July 15, 1944—91
Week ending July 22, 1944—*94*

†Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.

FOR *Better* RESULTS TRY WITCO'S NO. 11

WITCO CARBON BLACK NO. 11 is a dustless, cleaner carbon black that disperses readily and evenly to impart a deep, rich tone to your black papers. It is more economical... gives finer, more uniform results and may be placed directly in the beater without removal from the bag. Avail yourself of this opportunity to improve and reduce the cost of your black papers. Write for samples today.

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Nature is good to makers of FINE PAPERS

Consider for a moment the war-time situation of makers of fine papers—pulp supply largely curtailed; restrictions on weight of stocks; limitation on brightness of products. All of which would *seem* to contribute to quite a predicament.

In this emergency Nature's goodness to makers of fine papers is revealed in the great store of titanium ore, the base of all TITANOX pigments, deposited in the heart of the Adirondack Mountains. Through this American raw material source, developed by the Titanium Pigment Corporation, titanium pigments are made available which build opacity into even light-weight papers, give extreme whiteness with minimum pigmentation, and provide greater *visual* brightness within authorized limits than do pigments of the yellow-white type.

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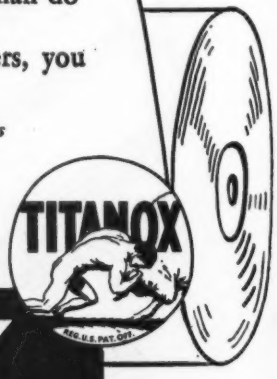


TITANOX
TRADE MARK

Section of the
TECHNICAL ASSOCIATION
OF THE PULP & PAPER INDUSTRY
122 E. 42nd St., New York 17, N. Y.
Edited by R. G. Macdonald, Secretary

TAPPI Standards

As a result of a ballot of the TAPPI membership recently completed the following major revisions of Official Standards were approved:

T 403 m-41 Bursting Strength of Paper.[1]

T 448 m-41. Water Vapor Permeability of Paper and Paperboard.[2]

The following Tentative Standards were advanced to Official Standards:

T 429 m-42 Alpha-, Beta- and Gamma-Cellulose in Paper

T 450 m-43 Pentosans in Paper

It is expected that copies of these in looseleaf form will be mailed shortly to the membership, together with a number of standards which have been corrected and various standards and methods which have been published since the last general mailing to the membership.

On account of criticisms received on the ballots, the following are continued for the present as Tentative Standards:

T 437 m-43. Dirt in Paper

T 446 m-42. Creasing Quality of Paper

T 454 m-42. Turpentine Test for Grease Resistance of Paper

T 457 m-42. Stretch of Paper and Paperboard

T 459 m-42. Wax Test for Surface Strength of Paper

T 460 m-43. Air Permeability of Paper

TAPPI Notes

Leon H. Mimms is now superintendent of the coating mill, Kalamazoo Paper Company, Kalamazoo, Mich.

H. N. Simpson, formerly with the Sorg Pulp Company is now manager, Northwest Filter Company, Seattle, Wash.

Vernon Woodside of the Mathieson Alkali Works has been transferred from Charlotte, N. C. to Niagara Falls. N. Y.

Allan G. Strang, formerly of Bowaters Newfoundland Pulp and Paper Mills is now instrument engineer, Puget Sound Pulp and Timber Company, Bellingham, Wash.

John B. Chandler formerly of the Bell Aircraft Corporation is now field engineer for the Bristol Company, 231 Healey Bldg., Atlanta 3, Ga.

A. Moltke-Leth is now with Fabrica El Progreso Industrial, Distrito de Tlanepantla, Estado de Mexico, Mexico.

Herbert W. Rowe, formerly of the U. S. Cartridge Company is now research engineer for the Sefton Fibre Can Co., Maplewood, Mo.

H. W. Guettler is president of the Fibre Making Processes, Inc., San Francisco, Calif.

Herman Gevers is consultant for the St. Regis Kraft Company, Tacoma, Wash.

Clarence H. Butterfield is engineer for the Master Electric Company, Dayton, Ohio.

E. K. Mansfield is production manager, Board Mills, Robert Gair Company, 155 E. 44th St., New York, N. Y.

Howard W. Hall, formerly of the Dicalite Company is now general manager of Citrus Concentrates, Inc., Dunedin, Fla.

[1] *Paper Trade J.* 118, No. 19:43 (May 11, 1944).
[2] *ibid* 118, No. 5:29 (Feb. 3, 1944).

Textbooks Still Going Strong

The McGraw-Hill Book Company reports the sale of 527 volumes of the Textbooks upon the Manufacture of Pulp and Paper during the first half of 1944. This is 152 volumes more than were sold in the same period last year, and is conclusive evidence that the pulp and paper industry of North America is maintaining and increasing its efforts to turn out a good product in time of war, says Royal S. Kellogg, secretary of the Joint Textbook Committee.

Total sales of these books since the appearance of Volumes I and II in 1921 have now exceeded 37,000 copies which have gone to all parts of the world.

Volumes I and II deal with the preliminary sciences and are not necessary for students who already have college training. The other three volumes are devoted exclusively to problems in the manufacture of pulp and paper and consequently are much more in demand. These volumes have been revised twice, and plans are well advanced for publication of a third revision as soon as possible after the cessation of hostilities. The Joint Textbook Committee of the Paper Industry receives all royalties from the sale of the books and thus is automatically financed to carry on all desirable revisions.

The detailed sales record is as follows:

	Textbook Sales 1st Half 1944	Total To Date
Volume I	61	5,175
Volume II	55	4,371
Volume III	152	11,178
Volume IX	145	8,776
Volume V	114	7,636
Total	527	37,136

Chemical Dictionary

The Blakiston Company has recently published Hackh's Chemical Dictionary, Third ed, revised and edited by Julius Grant, author of the Laboratory Handbook of Pulp and Paper Manufacture (925 pp. 6½ x 9½). It contains the words generally used in chemistry and related sciences and is based on recent chemical literature with numerous tables, diagrams, portraits and other illustrations.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 E. 42nd street, New York 17, N. Y. at $12.00 per copy.

Effect of Esterification of Pulp Fibers Upon Strength Properties, Hygroscopicity, and Hygroexpansivity of Paper*

By James J. Harrison[1]

Abstract

To obtain more information concerning the role played by the free hydroxyl groups of cellulose in the papermaking process, the influence of partial acetylation of rag stock and Mitscherlich pulp (without chemical degradation and with retention of the original fibrous structure) upon their papermaking properties was investigated in two previous papers of this series. It was found that, with increasing acetyl content above a certain relatively low value (which varied somewhat with the cellulose sample), the fibers gradually lost their ability to become hydrated when beaten or merely defibered and to undergo bonding when the water was removed during sheet formation. However, with fibers of increasing acetyl contents below the critical range, the physical strength properties of the sheets prepared from such fibers increased and attained a maximum. A hypothesis was suggested to explain these phenomena.

In the present investigation, these results were confirmed. In addition, the study was extended to the effect of partial butyrylation and stearoylation of Mitscherlich pulp. In was found that the antibonding effect of the ester groups increased with the length of their carbon chain and that a lower degree of substitution sufficed to bring about the same changes as observed with acetylated fibers of a higher degree of substitution. Likewise, the hygroscopicity and hygroexpansivity of the sheets—both being a function of the availability of free hydroxyl groups—were considerably reduced with increasing degree of substitution and increasing length of the acyl carbon chain.

In the previous papers it was shown that a fair proportion of the physical strength properties could be retained by the sheets if acetone (in which the esterified fibers swelled but did not dissolve), instead of water, was chosen as a beating and sheet-forming medium. In the present investigation, this result was confirmed for the acetylated materials and found to hold also for the butyrylated fibers. Substantial reductions in hygroscopicity and hygroexpansivity without too much loss in physical strength were realized also when, instead of acetone, an emulsion of a relatively small quantity of benzene in water was used for beating and sheet making. On the other hand, the use of organic liquids was unsuccessful with stearoylated fibers even of a very low degree of substitution and in spite of the fact that they swelled in these liquids quite distinctly, which is probably the result of the combined effects of the length of the stearoyl chain and its very pronounced hydrophobic character.

The pronounced affinity of cellulose for water—i.e., its hygroscopicity and ability to swell—is attributed chiefly to the abundance of free hydroxyl groups which it contains *(1)*. If part or all of these groups are replaced by ester groups, hygroscopicity and swelling ability decrease. For example, Sheppard *(2)* found that the water-binding capacity of cellulose acetate decreased with increasing acetyl content and that fibrous triacetate took up only 9% water as compared with 16% for unacetylated cotton fibers.

No doubt, the same forces by which the water molecules are held to the hydroxyl groups of cellulose are operative when cellulose fibers are beaten in the presence of water. In the light of Sheppard's results, it is conceivable that hydration and subsequent bonding of the fibers when the water is removed and the sheet is formed would be seriously impeded if part or all of the hydroxyl groups were replaced by ester groups. A direct proof could thus be furnished of the generally accepted view—that water binding and bonding are a function of the free hydroxyl groups of cellulose.

This proof was furnished in the first two papers of this series. In the first paper *(3)*, it was shown that rag stock fibers which had been partially acetylated without losing their fibrous structure and without degradation of the cellulose lost their papermaking properties as the acetyl content was increased over 8 to 9%, fibers having 20 to 25% acetyl being incompatible with water. However, fibers having acetyl contents below 8 to 9% gave sheets with increasing physical strength properties as the acetyl content was raised and attained a maximum at about 6% acetyl content. This phenomenon was explained on the assumption that the beating of cellulose fibers, in which the lateral distances between oriented chain molecules have been increased by the introduction of acetyl groups, renders a greater number of free hydroxyl groups accessible to hydration until, with further introduction of acetyl groups, hydration is counteracted and eventually overshadowed by the hydrophobic character of the more highly acetylated fibers. It was shown also that sheets of excellent physical properties and uniformity were obtained from these more highly acetylated fibers when the water was replaced by acetone as a beating and sheet-forming medium. This result was explained by the solvation of the acetyl groups by the acetone (in analogy with the hydration of hydroxyl groups by water in unacetylated fibers) and the development of bonding forces between the acetyl groups of adjacent fibers when the acetone was evaporated and the sheet was formed.

In the second paper *(4)*, these results were generally

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Hotel Commodore, New York, N. Y., Feb. 14-17, 1944.

A portion of a thesis presented in partial fulfillment of the requirements of The Institute of Paper Chemistry for the Degree of Doctor of Philosophy from Lawrence College, Appleton, Wis., May, 1943. This work was carried out under the direction of E. Heuser.

[1]Member TAPPI; Chemist, Ohio Boxboard Co., Rittman, Ohio.

confirmed by a study of another rag stock material as well as a bleached Mitscherlich pulp prepared from sprucewood. In addition, it was shown that the maximum in physical strength properties was obtained by merely subjecting the fibers to defibration (in the British disintegrator)—i.e., without actual beating, although the maximum was less pronounced than on beating. Furthermore, the coincidence between the maximum in physical strength properties and the maximum in hygroscopicity of the acetylated fibers, which was to be expected on the basis of the hypothesis advanced above, was actually observed; this hygroscopicity maximum was found for acetylated fibers which had not undergone even the process of defibration. Hence, it appeared that the mere opening of the micellar structure of the fibers on the introduction of acetyl groups sufficed to increase the accessibility of free hydroxyl groups to an extent which permitted the fibers to absorb more moisture from the surrounding atmosphere. With increasing acetyl content, however, the fibers became more and more hydrophobic, and the hygroscopicity dropped to lower values.

It would be expected that the hygroscopic behavior of the acetylated fibers would be reflected in a sheet prepared from such fibers and that, in addition, its hygroexpansivity—i.e., its ability to expand with increasing moisture absorption—would change accordingly. Since the physical strength properties, the hygroscopicity, and the hygroexpansivity of a sheet of paper are all a function of the hydroxyl groups of cellulose, it would be expected also that a direct relationship between these three characteristics would exist and that this relationship would, in turn, correlate with the acetyl content of the sheets.

In view of the observation that the hygroscopicity of cellulose esters decreases with the chain length of the acyl radical *(5)*, it seemed logical to expect that the hygroscopicity of sheets of paper prepared from fibers with increasing acyl chain length would be reduced in a similar manner and that hygroexpansivity and physical strength properties of such sheets would follow the same trend. In addition, it could be expected that, by introducing longer acyl chains, a lower degree of esterification than that required in the case of acetylation would suffice to produce similar changes in the three characteristics of the sheet.

The present study deals with the relationship between these three characteristics of handsheets prepared from acetylated, butyrylated, and stearoylated pulp fibers.

Experimental Procedures

The investigations were carried out with bleached Mitscherlich pulp having the physical strength characteristics shown in Fig. 1. Its degree of polymerization, determined according to the method described below, was 1653. The acyl content of the esterified samples varied over a wide range.

Acetylation

The fibers were acetylated with acetic anhydride and pyridine, using the modified method of Hess and Ljubitsch as employed by Bletzinger *(3)* and by Aiken *(4)*.

Varying acetyl contents were produced by varying the time, the temperature, and the concentration of the acetic anhydride. The temperature was 24° C. for acetyl contents up to about 16%. Acetyl contents above 16% were obtained by increasing the temperature to 40° C. The time the pulps were in contact with the acetylating bath varied from a few minutes to many days. For producing acetyl contents from about 2.5 to about 6%, it was necessary to lower the concentration of the acetic anhydride in the acetylation mixture, using a temperature of 24° C.

Table I shows the acetyl contents of the acetylated fibers and the percentage of hydroxyl groups in cellulose covered by acetyl groups.

The preparations were insoluble in acetone and other solvents for partially acetylated cellulose. Because the method of preparing the acetylated fibers was the same as that used in the preceeding investigations *(3, 4)*, it could be assumed that the degree of polymerization (D.P.) of the original fibers had remained unchanged. In fact, it was found that two preparations (14.05 and 17.14% acetyl) had a D.P. of 1610 as compared with a value of 1653 for the original fibers.

Butyrylation

The usual methods available for preparing cellulose butyrates (i.e., using butyryl chloride *(6)* or butyric anhydride and an acid catalyst *(7)* are not suitable, if degradation of the cellulose is to be avoided. Therefore, the Hess and Ljubitsch method was adapted to the present work by using a mixture of butyric anhydride and pyridine. The procedures and conditions were similar to those employed for acetylation. By varying the temperature and the time, a series of butyrylated pulp fibers, ranging from 8.36 to 22.95% butyryl, was obtained. The results are summarized in Table II. The lowest degree of substitution shown in Table II represents less than one third of one ester group per anhydroglucose unit and the highest degree was still below one ester group per anhydroglucose unit. The mono-ester stage requires 30.58% butyryl (C_3H_7CO) or 37.93% combined butyric acid.

Table II lists also the D.P. of the butyrylated pulps. By comparing these figures with the D.P. of the untreated pulp (1653), it is seen that the pulp suffered some degradation. However, it may be assumed that the decrease was too small as to have any marked influence upon the physical strength properties of the butyrylated fibers. All preparations were insoluble in acetone and in benzene and showed increasing incompatibility with water with increasing butyryl content.

TABLE II.—BUTYRYLATION OF MITSCHERLICH PULP

Time, hr.	Temperature, °C.	Butyryl Content, %	Hydroxyl Groups Covered, %	D.P.
2	25	8.36	7.8	....
8	60	14.00	12.2	1490
24	60	17.45	16.0	....
86	60	20.35	19.2	1480
256	60	22.95	22.2	1510

Stearoylation

Cellulose stearates have been prepared by using stearic anhydride in the presence of sodium hydroxide *(8)*. However, the rate of reaction under these conditions is extremely slow. Further, the anhydride was not available and is difficult to prepare in the laboratory. The method used was the that of Grün and Wittka *(9)*, according to which the cellulosic material

TABLE I.—ACETYL CONTENTS AND DEGREE OF SUBSTITUTION OF ACETYLATED PULP PREPARATIONS

Acetyl content, %	2.52	2.64	4.65	4.7	5.87	8.9	10.05	10.66	12.57	14.5	15.87	18.1	20.1	25.65
Hydroxyl groups covered, %	3.2	3.4	6.12	6.19	7.22	12.24	14	14.85	18	21.21	23.6	27.6	31.4	43

is heated on the water bath with a mixture of stearoyl chloride and pyridine with or without benzene as a diluent. The cellulose stearates obtained by Grün and Wittka showed signs of considerable degradation of the cellulose constituent. For this reason, the temperature was not allowed to rise higher than 40° C. in the present investigation.

Upon the addition of stearoyl chloride to pyridine, a precipitate is formed consisting of stearoylpyridinium chloride which, however, dissolves on the addition of benzene at slightly elevated temperature. Because the formation of the precipitate is accompanied by a rise in temperature, the esterification mixture was, in most cases, cooled to room temperature before it was added to the pulp.

At the end of the esterification period, the stearoylation mixture was partially removed by filtering the suspension on a Büchner funnel; the stearoylated pulp pad was then transferred to a 3-liter beaker and washed once with hot benzene and once with hot alcohol-benzene. Thereafter, the material was extracted in a Soxhlet apparatus successively with benzene, alcohol, and ether, each extraction being for 24 hours. After removing the ether by suction, the esterified pulp was allowed to dry in the air for several hours.

The stearoyl contents and the percentage of hydroxyl groups covered are shown in Table III.

TABLE III.—STEAROYL CONTENTS AND DEGREES OF SUBSTITUTION OF STEAROYLATED PULP PREPARATIONS

Apparent stearoyl content, %....	15.8	32.8	42.6	51.5	52.7	60.2
Hydroxyl groups covered, %....	4.1	10	15	21.7	22.8	30.7

The lowest degree of substitution reached under the conditions as described was only a small fraction of one stearoyl group per anhydroglucose unit, but the percentage weight increase was relatively high, because of the relatively large molecular size of the stearoyl group (the molecular weight of $C_{17}H_{35}CO$ is 267). The highest degree of substitution corresponded to nearly the mono-ester stage, which requires 62.3% stearoyl or 66.3% combined stearic acid.

As will be shown below, the D.P. of the stearoylated materials could not be determined. Therefore, it is uncertain to what extent the stearoylated fibers were degraded. Some degradation was to be expected as a result of the use of acid chloride which always (in spite of the presence of an excess of the base) attacks cellulose to a varying degree. The fact that all preparations retained their fibrous structure seems to indicate that the D.Ps. were still fairly high. The insolubility of the preparations in the common organic solvents and solvent mixtures, however, may or may not be an indication of a relatively high D.P., for it is possible that even the highest degree of substitution obtained was still too low to impart organophilic properties to the esterified fibers.

For a better understanding of the effect of stearoylation, the percentage weight increase must be taken into consideration. In other words, a relatively large portion of the stearoylated fibers consisted of highly hydrophobic stearoyl, in contrast to the butyrylated and the acetylated fibers, in which the percentage weight increases of less hydrophobic acyl were much smaller. Indeed, the introduction of stearoyl to cover only about 4% of the available free hydroxyl groups (corresponding to about 16% stearoyl calculated on the weight of the esterified fibers) caused a radical change in the properties of the pulp; the fibers had a fatty feel and were entirely incompatible with water. Held under water, even for hours, by means of a glass rod, they were not wetted and quickly rose to the surface when they were released.

Determination of the Degree of Esterification

The Eberstadt method as modified by Genung and Mallatt *(10)* was used for determining the acetyl and butyryl contents of the preparations; a suspension of the sample in aqueous alcohol was saponified with sodium hydroxide and the unconsumed alkali determined by titration with hydrochloric acid. All determinations were run in triplicate.

Difficulties were encountered in determining the stearoyl content of the preparations with sufficient accuracy by the modified procedure suggested by Genung and Mallatt *(10)* for the acyl determination of cellulose higher fatty acid esters. The values obtained appeared to be much too high, even after the preparations had been thoroughly extracted as described above. Grün and Wittka *(9)* encountered similar difficulties and, therefore, resorted to the extraction of the stearic acid, after saponification and acidification, and its subsequent gravimetric determination, a technique which was used by subsequent investigators *(11)* and also in the present investigation. The values thus obtained checked within 1% with each other. The commercial stearoyl chloride used in this investigation was only 95% pure, containing about 4% palmitoyl chloride and 1% oleic acid and other acid chlorides. The values listed in Table III and later compilations are thus "apparent" stearoyl contents.

Determination of the Degree of Polymerization

The D.P. of the acetylated and butyrylated fibers was derived from specific viscosity measurements, using Staudinger's viscosity-molecular weight function *(12)*. According to Staudinger and Daumiller *(13)*, cellulose acetates dissolve in cuprammonium hydroxide because they are saponified to yield regenerated cellulose. Thus, if the usual precautions are observed, the specific viscosity may be determined in this solution and, hence, represents that of the regenerated cellulose. This method, which also was used by Bletzinger *(3)*, was employed in the present investigation, and its application was extended to the butyrylated fiber preparations. The apparatus used and the procedures followed for determining the specific viscosity in cuprammonium hydroxide have been described by Heuser and Green *(14)*. For calculating the molecular weights from the specific viscosity data the value of 5×10^{-4} was used for Staudinger's constant (k_m). The D.P. is obtained by dividing the molecular weight of the preparation by 162 (the molecular weight of the anhydroglucose unit).

Difficulties were encountered in determining the D.P. of the stearoylated fibers by the method described above. The esterified fibers were insoluble in cuprammonium hydroxide, which confirms the observation of Grün and Wittka *(9)*. But, strangely enough, the cellulose preparations regenerated from the esterified fibers by saponification were also insoluble in cuprammonium hydroxide, and none of the swelling pretreatments (with strong alkalies and acids) which were applied to the regenerated preparations was capable of restoring its lost reactivity. Because all ester preparations were insoluble in the usual organic solvents (for example, benzene, toluene, xylene, monochlorobenzene, *m*-cresol, carbon tetrachloride, acetone,

and chloroform), the common methods of determining the specific viscosity of cellulose esters in organic solvents could not be used either.

The resistance of the regenerated cellulose to the dissolving action of cuprammonium hydroxide and other strong bases would seem to indicate that the physical structure of the cellulose constituent has undergone a radical change during esterification. The possibility exists that the introduction of the relatively long acid chains has brought about a change in the ratio of the crystalline to the amorphous portion. This change could consist of an initial increase in the amorphous portion which, however, would be followed by an increase in parallel orientation and crystallization when the saponified fiber is exposed to the effect of tension by drying. If the increase of the crystalline portion is sufficiently pronounced, this change might account for the resistance to the dissolving action of the strong bases.

Beating and Testing of Handsheets for Physical Strength Properties

In accordance with the procedure used by Aiken *(4)*, the original pulp, as well as the esterified fibers, were beaten in a Lampén mill. The procedure for beating described in the Second Report of the Pulp Evaluation Committee of the Technical Section of the Paper Makers' Association of Great Britain and Ireland *(15)* was followed, with the exception that, after disintegration, the pulp was concentrated by filtering on a Büchner funnel instead of using a screen thickener. A charge of 18 grams (moisture-free pulp basis) was used, and the consistency was maintained at 3%. All the materials were soaked in the processing medium for at least 12 hours prior to beating.

A strength development curve was obtained for the original pulp by subjecting it to various degrees of beating. The intervals chosen were 0, 10, 20, 40, and 60 minutes. It appeared that the maximum strength for the pulp in question was reached between 20 and 40 minutes. The acetylated pulps were beaten for 0, 20, 40, and 60 minutes. In all cases, the maximum strength was found to be very close to the 40-minute beating interval. For this reason, the butyrylated and stearoylated materials were beaten for 40 minutes only. In addition, the values were determined for the unbeaten materials.

The sheets prepared from the esterified pulps were formed, pressed, dried, and conditioned according to TAPPI Standard T 205 m-40. Likewise, the sheets

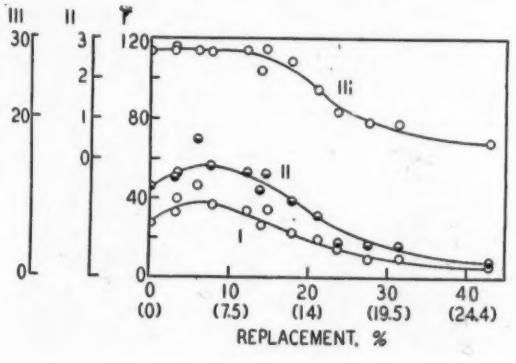


Fig. 1

Physical strength properties of acetylated pulps (zero beating interval). I. Bursting strength; II. Tensile strength; III. Tearing strength

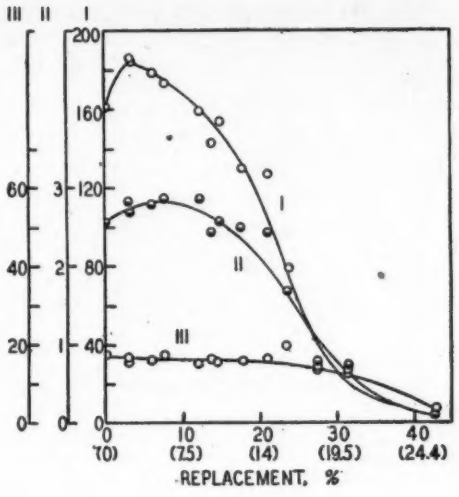


Fig. 2

Physical strength properties of acetylated pulp (40-min. beating interval). I. Bursting strength; II. Tensile strength; III. Tearing strength

were tested according to TAPPI Standard for basis weight (T 410 m-41), caliper (T 411 m-36), and for tearing (T 414 m-40), bursting (T 403 m-36), and tensile strengths (T 404 m-41). Trimmings from the tested sheets were used for the determination of the moisture content.

Hygroscopicity Measurements

The amount of water absorbed by the esterified and unesterified materials from the air at various relative humidities was determined by ascertaining directly the increase in weight of the materials. The method used was essentially that followed by Aiken *(4)*. The acetylated sheets were measured at about 20, 40, 60, 80, and 90% R.H., but for the butyrylated and stearoylated sheets the measurements were confined to 60, 80, and 90% R.H., because it was in this range wherein the differences were the largest and could be observed with the greatest ease. The determinations were made on the handsheets from the zero and 40-minute beating intervals. These handsheets were a portion of the lot which had been used for physical strength testing.

Hygroexpansivity Measurements

The term "hygroexpansivity" may be defined as the property of a paper to expand or contract with a change in the relative humidity of the surrounding atmosphere. The methods of measuring the expansion and contraction of paper with a change in relative humidity have been reviewed by Van den Akker *(16)*. The original Neenah expansimeter was designed to accommodate two test samples. The new instrument developed by Van den Akker, Root, and Wink *(17)* permits twenty specimens to be measured simultaneously. This multiple-specimen Neenah expansimeter was used throughout the present investigation. Hygroexpansivity measurements were made at the humidities employed in the hygroscopicity measurements on handsheets prepared from the original pulp as well as from the esterified materials. Again, these sheets were a portion of the lot which had been prepared for physical testing.

Experimental Results

Acetylated Fibers

Physical Strength Properties. The change in the physical strength properties of acetylated fibers with increasing acetyl content is shown in Fig. 1 for the unbeaten and in Fig. 2 for the beaten materials. (In this and following figures, the word "replacement" signifies the percentage of hydroxyl groups replaced by acyl groups; the percentage of acyl groups by weight is given in the parentheses; the bursting strength is in pounds/square inch per 100 pounds, the tearing strength is in grams/basis weight, and the tensile strength is in pounds/100 pounds.)

The curves follow the same general trend as observed by Bletzinger and by Aiken with rag stocks and Mitscherlich pulp. There was an initial maximum in bursting and tensile strengths with the introduction of a small percentage of acetyl. As the degree of acetylation increased to values above the optimum, the strength properties fell rapidly until, at the highest acetyl content, they became practically zero. The changes were less pronounced with the tearing strength.

The maxima in bursting and tensile strengths were attained when the acetyl content was between 6 and 8%; in fact, the strength properties were even above those of the original material until an acetyl content of about 10% was reached. The maxima were more pronounced with the beaten material.

Likewise, as previously observed *(3, 4)*, the acetylated fibers became more and more hydrophobic as the degree of substitution was increased, and were more difficult to break up and to beat.

Microscopic observation of the acetylated fibers (acetyl contents of 25.65% and higher) after beating showed that they had become powdery and had been broken rather than fibrillated. Furthermore, they did not show the usual brushed-out ends but remained more or less blunt. Photomicrographs of the unbeaten and beaten original pulp, as well as of the beaten pulp containing 25.65% acetyl, are shown in Figs. 3, 4, and 5. These photomicrographs were taken with dark field illumination at a magnification of 100. The fact that the fibers were broken and had little tendency to fibrillate obviously explains, in part, the lack of strength development observed when the pulps with the higher acetyl contents were beaten in water.

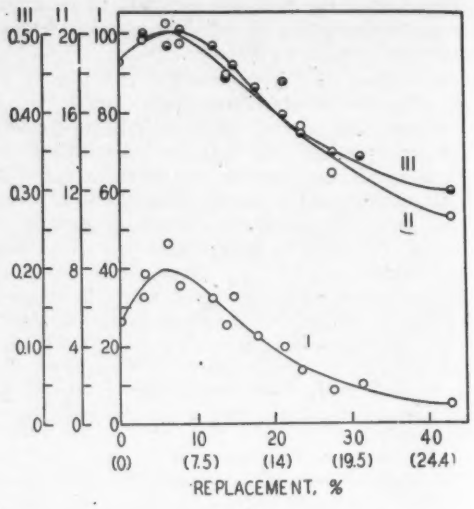


Fig. 6

Comparison of properties of acetylated pulps (zero beating interval). I. Bursting strength; II. Hygroscopicity; III. Hygroexpansivity

The Hygroscopicity of the Acetylated Pulps and its Relation to their Physical Strength Properties. The data (referring to 90% R.H.) are shown in curves II of Fig. 6 for the sheets prepared from the unbeaten and of Fig. 7 for those prepared from the beaten materials. The hygroscopicity is expressed as the percentage moisture content at 90% R.H. It is seen that the hygroscopicity of both the unbeaten and the beaten samples increased with the introduction of small amounts of acetyl and reached a maximum, which was followed by a rather rapid decrease as more hydroxyl groups were replaced. With a few exceptions, the beaten stock appeared to have a slightly higher moisture content at a given acetyl content than the unbeaten material. The maximum for the unbeaten materials was reached at an acetyl content of 4.6% and amounted to 20.5% against 18.6% for the sheets prepared from the original unbeaten pulp, corresponding to an increase of about 10%. This increase was maintained up to an acetyl content of approximately 8%. The hygroscopicity then decreased but was practically still that of the original material at an acetyl content of about 10%. There-

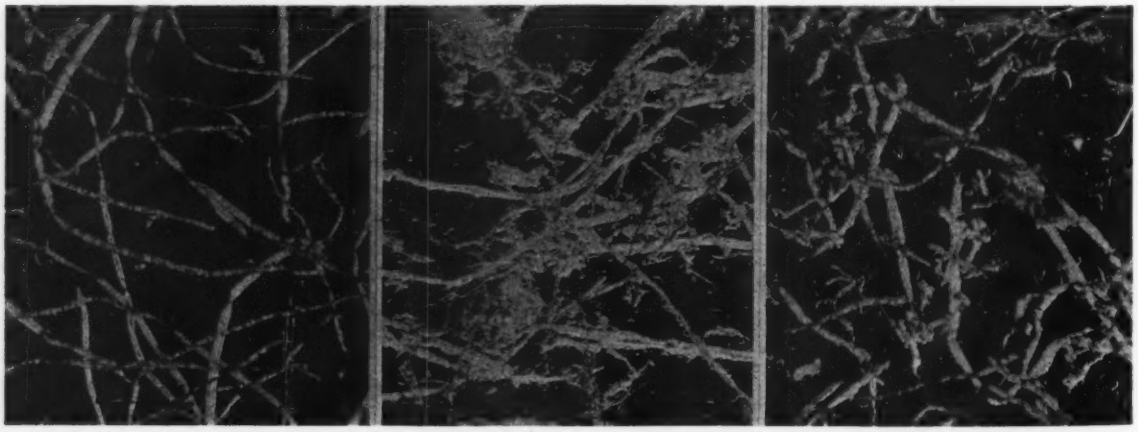


Fig. 3 Fig. 4 Fig. 5

Fig. 3. Unacetylated Mitscherlich Pulp (zero interval). Fig. 4. Unacetylated Mitscherlich pulp (40-min. interval). Fig. 5. Acetylated Pulp (25.65% acetyl content). Processed in water—40-in. interval

after, the value approached a minimum which coincided with the lowest acetyl content of the series and amounted to 10.6%, corresponding to a reduction of 43%.

For the beaten materials (Fig. 7), the hygroscopicity maximum, which was somewhat less sharp, occurred at the same acetyl content (4.6%) and amounted to 19.7% against 18.3% for the original beaten pulp, corresponding to a reduction of about 6%. The hygroscopicity minimum was 12% against an original of 18.3%, corresponding to a reduction of about 34%.

To demonstrate the existence of the expected relation between the hygroscopicity and the physical strength properties at various acetyl contents, the bursting strength was selected as the most characteristic of the physical strength properties of the sheets. These values were plotted against the percentage of hydroxyl groups of the cellulose replaced by acetyl groups and are shown in Fig. 6 for the unbeaten materials and in Fig. 7 for the beaten materials. The range in which the maximum in bursting strength occurred coincided with the maximum in hygroscopicity; with further increase in the acetyl content, both physical strength properties and hygroscopicities dropped in about the same manner.

The Hygroexpansivity of the Acetylated Pulps and its Relation to Other Properties. The results are shown in curves III of Figs. 6 and 7. The hygroexpansivity is expressed as the percentage change in length over the humidity change of 10 to 80%. It is seen that the relation between hygroexpansivity, hygroscopicity, and bursting strength was rather close for the unbeaten materials. The hygroexpansivity first increased and reached a maximum at an acetyl content between 2 and 6%, which is close to the range in which the maximum hygroscopicity and maximum bursting strength were observed. It then fell and followed closely the drop in hygroscopicity and bursting strength as the acetyl content approached the highest value (25.65%). The maximum decrease in hygroexpansivity from that of the unacetylated materials was from 0.465 to 0.30%, corresponding to a decrease of about 35%.

For the beaten materials, the hygroexpansivity started with a higher value than shown by the unbeaten materials and decreased to a minimum value. The hygroexpansivity of the unacetylated pulp was 0.52%, and those at the maximum hygroscopicity were between 0.4 and 0.45%. Above an acetyl content of 18 to 20%, the hygroexpansivity dropped sharply. At the highest acetyl content (25.65%), the value was 0.255%. The maximum reduction in hygroexpansivity was from 0.52 to 0.255%, or approximately 50%.

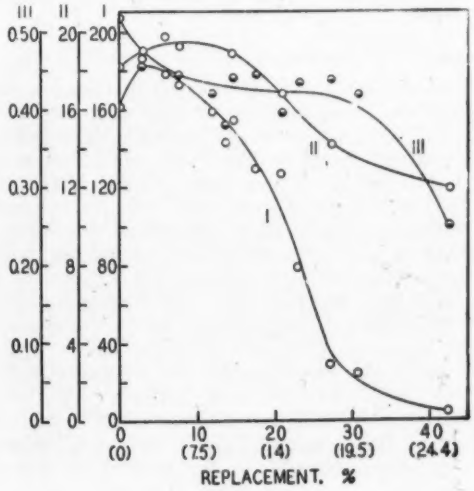


FIG. 7

Comparison of properties of acetylated pulps (40-min. beating interval). I. Bursting strength; II. Hygroscopicity; III. Hygroexpansivity

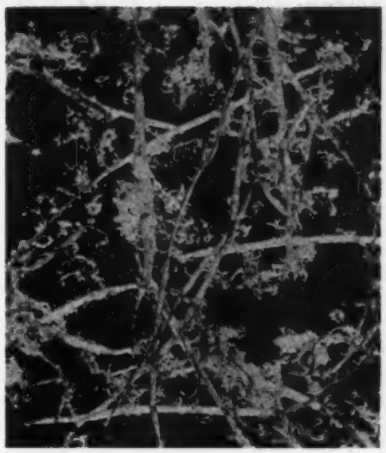


FIG. 8

Acetylated pulp (25.65% acetyl content). Processed in acetone—40-min. interval

In the light of a possible commercial utilization of the reduced hygroexpansivity of a sheet of paper prepared from acetylated fibers, it is unfortunate that, as the hygroexpansivity was reduced, the physical strength properties also decreased. Thus, a reduction in hygroexpansivity of approximately 50%, which would be very appreciable for commercial purposes, was realized only when the physical strength properties were also at a minimum.

Physical Strength Properties and Hygroexpansivity of Acetylated Fibers Processed in Acetone. As mentioned earlier and as shown in the previous papers *(3, 4)*, the bonding capacity of cellulose fibers, which was lost when their acetyl content was increased to a certain value, could be restored by partly or entirely substituting acetone for water as a beating and sheet-forming medium. Sheets thus prepared were considerably hydrophobic. Therefore, it was reasonable to expect that such sheets would also show reduced hygroexpansivity and that this characteristic would thus coincide with a certain restoration of physical strength.

TABLE IV.—COMPARISON OF STRENGTH PROPERTIES OF SHEETS PROCESSED IN WATER AND IN ACETONE

	Basis Weight	Apparent Density	Burst Factor	Tear Factor	Tensile Factor
Unacetylated Bleached Mitscherlich Pulp—Processed in Water					
Zero interval	43.4	10.1	26.2	2.68	11.2
40-minute interval ...	43.5	16.3	161.0	0.89	51.1
20.1% Acetyl Content—Processed in Water					
Zero interval	42.2	7.67	9.5	0.804	3.96
40-minute interval ...	42.2	12.86	25.0	0.659	14.4
20.1% Acetyl Content—Processed in Acetone					
Zero interval	42.4	8.91	15.4	0.54	6.77
40-minute interval ...	41.0	13.94	60.8	0.978	20.7
25.65% Acetyl Content—Processed in Water					
Zero interval	43.6	6.51	4.6	0.38	1.76
40-minute interval ...	42.0	9.77	5.2	0.22	2.3
25.65% Acetyl Content—Processed in Acetone					
Zero interval	42.3	8.3	12.9	1.15	6.95
40-minute interval ...	43.1	13.9	55.7	0.78	23.9
60-minute interval ...	43.9	12.9	48.8	0.918	21.4

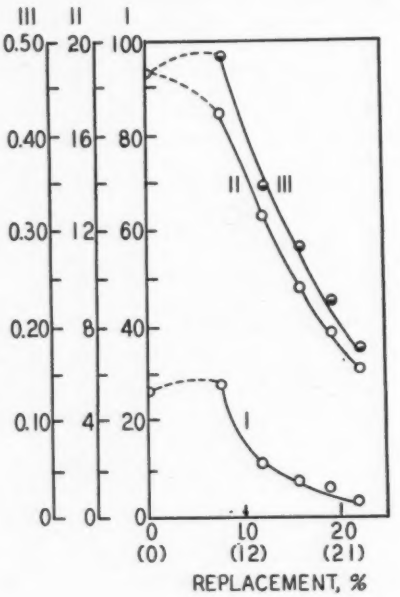
TABLE V.—EFFECT OF ACETONE ON HYGRO-EXPANSIVITY

	Bursting Strength		Humidity Change 10% to 30%		Humidity Change 10% to 60%		Humidity Change 10% to 80%	
	0*	40-min.**	0	40-min.	0	40-min.	0	40-min.
			20.1% Acetyl Content					
Water	9.5	25.0	0.06	0.075	0.205	0.27	0.34	0.42
Acetone	15.4	60.8	0.039	0.065	0.161	0.229	0.27	0.39
			25.65% Acetyl Content					
Water	4.6	5.2	0.04	0.045	0.175	0.16	0.30	0.255
Acetone	12.9	55.7	0.035	0.045	0.13	0.165	0.22	0.275

* Zero interval or unbeaten.
** 40-minute beating interval.

The procedures of beating and sheet forming in the acetone medium were essentially the same as when water was used, the only difference being that, as a result of the greater volatility of the acetone, the operations had to be carried out with greater speed; in addition, the effluents from the sheet machine were not discarded but reused. Sheets were prepared from the unbeaten materials and from those beaten for 40 minutes and tested for physical strength properties and hygroexpansivity as described for the materials beaten in water. The materials selected were those with 20.1 and 25.65% acetyl. The results were compared with those obtained with the water-beaten pulps of the same acetyl contents. Table IV shows the physical strength properties and apparent densities and Table V the hygroexpansivities.

It is seen from Table IV that the pulp containing 20.1% acetyl, when processed in acetone, showed a definite increase in strength properties over those obtained with the water-processed sheets. For instance, the bursting strengths of the acetone-processed sheets from the unbeaten and beaten materials were 15.4 and 60.8, respectively, as compared with 9.5 and 25 for the water-processed sheets. For the material containing 25.65% acetyl, the values were 12.9 and 55.7, respectively, as compared with 4.6 and 5.2 for the water-processed sheets. The acetone-processed sheets were remarkably water- and ink-resistant, confirming previous observations *(3, 4)*. Under the microscope, the fibers showed considerable fibrillation and the brushed-out appearance of fiber ends (see Fig. 8), similar to the unacetylated fibers beaten in water (Fig. 4) but much in contrast to the acetylated fibers beaten in water (Fig. 5).



F.G. 9

Comparison of properties of butyrylated pulps (zero beating interval). I. Bursting strength; II. Hygroscopicity; III. Hygroexpansivity

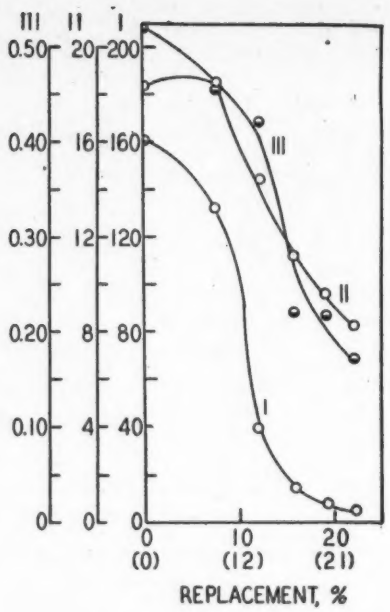


FIG. 10

Comparison of properties of butyrylated pulps (40-min. beating interval). I. Bursting strength; II. Hygroscopicity; III. Hygroexpansivity

The unbeaten materials, processed in acetone, showed a somewhat lower hygroexpansivity (Table V) than those processed in water, but the values of the beaten materials agreed fairly well. The material with the higher acetyl content yielded slightly better results. The best reductions in hygroexpansivity, compared with those of sheets prepared from the *unacetylated* pulp, were from 0.465 to 0.22% or 52.7% for the unbeaten sheets, and from 0.52 to 0.27%, or 48% for the beaten sheets. Such reductions in hygroexpansivity were thus realized with sheets which still possessed fairly good physical strength properties.

BUTYRYLATED FIBERS

Physical Strength Properties. The strength properties of the butyrylated pulps were evaluated at the zero and 40-minute beating intervals. The bursting strengths are shown in Fig. 9 for the unbeaten and in Fig. 10 for the beaten materials. It is seen that the butyrylated pulps processed in water suffered a sharp decrease in bursting strength as the degree of substitution was increased and that it was practically negligible after a butyryl content of between 17 and 21% had been reached, corresponding to a replacement of between 15 and 19% of the hydroxyl groups. In the low range of substitution, the loss in strength was small. For example, the lowest butyryl content (8.36%) produced a bursting strength of 28 for the unbeaten and of 131 for the beaten materials. The difference between the beaten and the unbeaten samples became smaller as the butyryl content was increased.

If the strength properties of the acetylated and butyrylated pulps are compared, it will be seen that

the presence of between 17 and 21% butyryl (15 to 19% of the hydroxyl groups replaced) had about the same effect on the strength properties as 20 to 25% acetyl (30 to 45% of the hydroxyl groups replaced). Thus, with butyrylation a lower percentage of acyl and a lower degree of substitution sufficed to produce a result equivalent to that obtained with acetylation.

It should be added here that the physical strength properties of the butyrylated pulps did not show the maximum in the lower range of substitution, as was observed with the acetylated fibers. It is possible that the maximum would have been observed, if the degree of substitution had been kept below a butyryl content of 8.36%. Curve I in Fig. 9 seems to indicate this tendency between zero and the first point of the curve.

Microscopic observations of the beaten pulps demonstrated that the fibers with the higher butyryl contents and possessing very low strength properties had been crushed and broken during the beating operation in much the same way as were the more highly acetylated fibers.

Table VI contains data obtained by 40 minutes of beating butyrylated fibers in acetone and in a 5% benzene-water emulsion. The butyryl content of the material was 22.95% (22.2% replacement of hydroxyls) for the processing in acetone and 20.35% (19.2% replacement) for the benzene-water emulsion. The data are compared with those resulting from the same butyrylated materials beaten for the same length of time in water.

TABLE VI.—PHYSICAL STRENGTH PROPERTIES OF BUTYRYLATED PULPS PROCESSED IN ACETONE, IN A BENZENE-WATER EMULSION, AND IN WATER

Beating Medium	Caliper	Basis Weight	Apparent Density	Bursting Strength	Tear	Tensile Strength
Acetone (22.95% butyryl)..	5.0	58.6	11.7	31	1.86	13
Water (22.95% butyryl)..	5.4	56.0	10.3	4.7	0.17	1.2
Benzene-water emulsion (20.35% butyryl)..	4.7	50.2	10.7	30.5	0.90	11.8
Water (20.35% butyryl)..	5.0	53.7	10.7	7.5	0.28	3.9

The material containing 22.95% butyryl had a

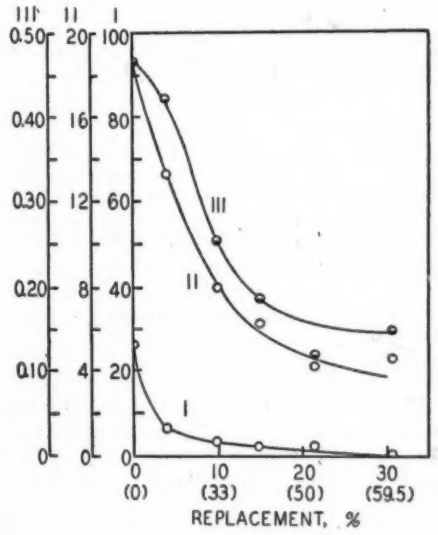


FIG. 11

Comparison of properties of stearoylated pulps (zero beating interval). I. Bursting strength; II. Hygroscopicity; III. Hygroexpansivity

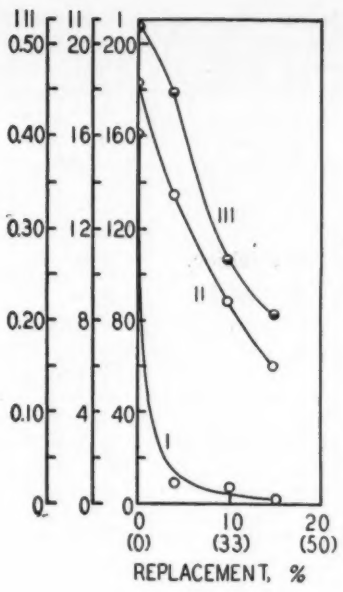


FIG. 12

Comparison of properties of stearoylated pulps (40-min. beating interval). I. Bursting strength; II. Hygroscopicity; III. Hygroexpansivity

bursting strength of about 31 when beaten for 40 minutes in acetone, as compared with 4.7 when beaten for the same time in water. This is quite a remarkable improvement and demonstrates the beneficial influence of acetone as a beating medium for the butyrylated pulp. A similar effect was obtained when a 5% benzene-water emulsion was used, a bursting strength of 30.5 being obtained, as compared with 7.5 when processed for the same time in water. The 5% benzene-water emulsion was prepared by stirring approximately equal parts of benzene and water for 5 minutes in a Waring Blendor. A small percentage of alpha protein (0.01%) was added to stabilize the emulsion. The water necessary to give a 5% benzene-water emulsion was then added, with very vigorous stirring. The butyrylated pulp, when processed in this emulsion, became very "slow,"—i.e., a long time was required for draining the stock.

Hygroscopicity and Hygroexpansivity of Sheets Prepared From Butyrylated Fibers. The data are plotted in Figs. 9 and 10 (curves II and III). It is seen that the hygroscopicity of the butyrylated pulps followed fairly closely the bursting strength values in much the same way as was shown with acetylated fibers. Thus the hygroscopicity decreased after the first few percentages of butyryl had been introduced. The beaten materials showed a slightly higher hygroscopicity than the unbeaten materials at the same butyryl content. With a degree of substitution of 22.2% (corresponding to a butyryl content of 22.95%), the hygroscopicity of the unbeaten pulp had decreased from 18.6% of the original (at 90% R.H.) to 6.1%, and of the beaten materials from 18.3 to 8.2%, corresponding to 70 and 56%, respectively.

The hygroexpansivities of the butyrylated sheets followed the same trend. The reduction was quite substantial. For the hygroexpansivity of the material with 22.95% butyryl it amounted to 62% (unbeaten) and 67% (beaten). If these reductions are compared with those observed with the acetylated

pulps, it becomes apparent that the butyryl group is considerably more efficient than the acetyl group. An acetyl content of 25.65% (43% replacement of hydroxyl groups) resulted in a reduction of only 40%.

From a commercial point of view the remarkable reduction in hygroexpansivity which may be obtained by the introduction of a limited amount of butyryl is worth attention because such a reduction may be combined with fair physical strength properties by beating the butyrylated material in acetone or a benzene-water emulsion.

Stearoylated Fibers

As before, the materials were processed in water at the zero and the 40-minute beating intervals. The results are shown in Figs. 11 and 12. The low bursting strength values indicate that the hydrating and bonding characteristics of the pulp fibers have been largely destroyed by the introduction of even a small amount of stearoyl. The sheets, particularly those prepared from the unbeaten materials, were rather bulky and all were very hydrophobic; even with as little as 4% of the hydroxyl groups replaced, they floated on water. Microscopic observations after beating showed even the very low-substituted fibers to be crushed and broken.

Part of the loss in physical strength may be the result of chemical degradation which probably took place during the esterification of the fibers, as was pointed out earlier. However, the indications are that the result is chiefly accounted for by the specific effect of the stearoyl group.

The hygroscopicity dropped rapidly with increasing degree of substitution; this drop was more pronounced than with the butyrylated fibers and particularly more so than with the acetylated fibers at about the same degree of substitution. Conversely, basing the comparison upon the same reduction in hygroscopicity, it was found that a replacement of about 4% of the hydroxyl groups by stearoyl caused approximately the same reduction (about 30%) as a replacement of about 12% by butyryl and of about 28% by acetyl groups.

Likewise, the hygroexpansivity decreased with increasing stearoyl content. The maximum reduction, amounting to 70 to 75%, occurred when between 20 and 30% of the hydroxyl groups were replaced (corresponding to a stearoyl content of between 50 and 60%). When the results are compared with those obtained with the butyrylated and acetylated materials, the same relationships as pointed out for the reduction in hygroscopicity are recognized. For example, to accomplish a reduction in hygroexpansivity of about 60%, a replacement of 15% was sufficient in the case of the stearoylated materials, whereas the butyrylated materials required a replacement of about 22 and the acetylated materials would have required a replacement of more than 43%.

The similarity in the slope of all three curves in Figs. 11 and 12 is quite obvious. Again, the greatest reductions in hygroscopicity and hygroexpansivity coincided with the lowest bursting strength.

The hope that such reductions could be accomplished without too much loss in strength by processing the stearoylated fibers in an organic liquid could not be realized. Numerous organic solvents were tried and although some of them (for example, xylene, benzene, triglycol dichloride, methyl carbitol acetate, and carbon tetrachloride) exerted a distinct swelling effect upon the stearoylated fibers, no bonding between adjacent fibers was accomplished.

Discussion

On the assumption that the ester groups arrange themselves at right angles to the fiber axis, the introduction of such groups will increase the lateral distances between the more or less parallel individual cellulose chain molecules, and these distances will become wider as the length of the esterifying group increases. Thus, the cellulose chains become less and less tightly packed, the lateral forces become weaker and the individual cellulose chains tend to slip when subjected to stress in the direction of the fiber axis. As a result, the tensile strength of the individual esterified fibers should decrease. Although it has been observed *(3)* that such a decrease did not occur with only slightly acetylated fibers, it would possibly occur with more highly acetylated material, and to an increasing extent with such esterified fibers which, as the butyrylated and stearoylated materials, contain chains of increasing length.

In addition, it would appear that, upon the removal of the water from an aqueous suspension of partly esterified fibers, the ester groups which protrude from the surfaces of the fibers in a direction perpendicular to the fiber axis impede intimate approach of these surfaces. As a result, the forces of attraction between opposing hydroxyl groups which were left unesterified are weaker, bonding between fibers is diminished, and the physical strength properties of the sheets are low. The magnitude of this effect would seem to depend again upon the degree of substitution and the length of the acyl chains in the esterified fibers.

In fact, as was shown in the first two papers of this series *(3, 4)* and confirmed by the results of the present investigation, fibers which are only slightly acetylated yield sheets which show a maximum in physical strength but, with increasing acetyl content, this property decreases and becomes almost zero. Within the small range of substitution the effect which leads to an opening of the micellar structure of the fibers is obviously utilized to considerable advantage in that it makes more free hydroxyl groups of the cellulose available for hydration and thus for subsequent increased bonding of opposing hydroxyl groups of adjacent fiber surfaces when the water is removed and the sheet is formed. Moreover, it would seem that, with acetylation, the binding of adjacent fiber surfaces is not diminished by acyl groups protruding from these surfaces because of the relative shortness of these groups. As the acetyl content of the fibers is further increased, the beneficial "distance-enlarging" effect is increasingly counterbalanced and eventually overcome by the water-repellent properties of the acetyl groups. Thus, a system develops in which the water-repellent forces of the acetyl groups are much stronger than the water-attracting forces of the remaining free hydroxyl groups. It is noteworthy that such a system existed when 57% of the total number of hydroxyl groups were still available for hydration (see Figs. 1 and 2, curves I). This observation may be interpreted to mean that the bonding effect in the papermaking process is limited to a certain number of selected hydroxyl groups in cellulose and that it is these critical hydroxyl groups that are substituted on acetylation, leaving the remaining free hydroxyl groups ineffective for hydration and bonding.

The above interpretation of the occurrence of a

strength maximum may also serve to explain the initial increase and subsequent decrease in hygroscopicity which was observed with sheets prepared from only slightly acetylated fibers. Within this low range of substitution, the distance-enlarging effect leads to increased moisture absorption. However, as the degree of substitution is increased, the water-repellent forces of the acetyl groups become predominant in their competition with the water-attracting forces of the remaining free hydroxyl groups.

The increasingly greater reduction in physical strength properties and hygroscopicity which were shown by the sheets prepared from the butyrylated and stearoylated fibers would seem to be in agreement with the observation *(5)* that the hydrophobic character of the acyl chains increases as their carbon chain becomes longer.

That no intial strength and hygroscopicity maxima were observed in the butyryl and stearoyl series seems to suggest that, in view of the much greater effectiveness of these two groups, the degrees of substitution were still too high. To retain the distance-enlarging effect of these groups, which makes more free hydroxyl groups available for hydration without interference by the more strongly hydrophobic character of these groups, much smaller quantities would have to be introduced.

The view that the properties of sheets prepared from partially esterified fibers are a function of both phenomena—the widening of the micellar structure and the interference with sufficiently intimate contact between fiber surfaces—seems to be supported by the apparent densities of the sheets. It was found that the apparent density decreased with increasing degree of substitution as well as with increasing length of the acyl chain. In other words, the packing of both the cellulose chains within the fibers and of the fibers themselves in the sheets become looser. This interpretation would seem to be in good agreement with the observation *(5)* that the density of cellulose esters decreases with the length of the carbon chain of the ester group. That the hygroscopicity of such systems did not increase, as may be expected to be true with sheets prepared from unesterified fibers was, no doubt, a result of the steadily increasing predominance of the hydrophobic properties of the acyl groups.

The change in apparent density would seem to furnish an additional explanation of the observation that the hygroexpansivity of sheets prepared from esterified fibers decreased with both the degree of substitution and the length of the carbon chain of the acyl group. Decreased apparent density of a sheet of paper may be interpreted to mean that the voids in such a sheet are large as compared with those in a denser sheet. It seems logical to reason that the expansion which the fibers in the sheet undergo in a humid atmosphere—as a result of their swelling in the direction perpendicular to their axes—is taken up

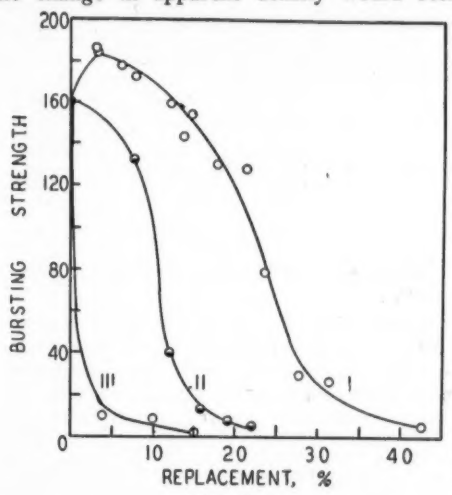


FIG. 13

Bursting strength of esterified pulps. I. Acetylated pulps; II. Butyrylated pulps; III. Stearoylated pulps

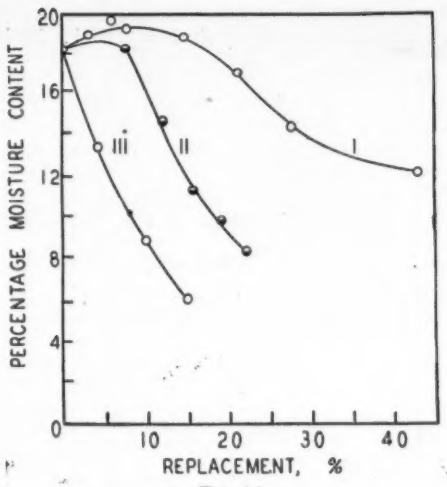


FIG. 14

Hygroscopicity of esterified pulps (40-min. beating interval). Relative humidity, 90%. I. Acetylated pulps; II. Butyrylated pulps; III. Stearoylated pulps

TABLE VII.—APPARENT DENSITY, HYGROSCOPICITY AND HYGROEXPANSIVITY OF SHEETS PREPARED FROM ESTERIFIED FIBERS

Ester Groups	Replacement of Hydroxyl Groups, %	Acyl Content by Weight, %	Apparent Density	Hygroscopicity 90% R.H., %	Hygroexpansivity 10-80% Humidity Change, %
Acetyl	21.2	14.5	9.76	17.5	0.395
Butyryl	22.2	22.95	6.20	6.1	0.175
Stearoyl	21.7	51.50	5.30	4.0	0.115

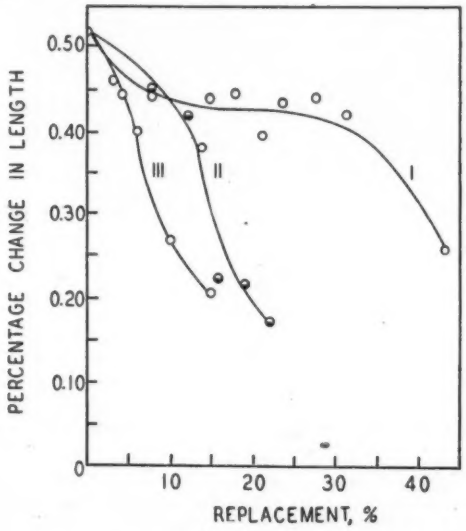


FIG. 15

Hygroexpansivity of esterified pulps (40-min. beating interval). Humidity change—10 to 80%. I. Acetylated pulps; II. Butyrylated pulps; III. Stearoylated pulps

by the voids and becomes measurable only if the voids are small—i.e., if the sheet is sufficiently dense. Thus, because increasing degree of substitution and increasing length of the acyl chain increase the size of the voids, the hygroexpansivity would be expected to decrease. In Table VII apparent densities of sheets prepared from unbeaten esterified fibers are compared with the corresponding hygroscopicities and hygroexpansivities at approximately the same degree of substitution (i.e., the same percentage of replacement of hydroxyl groups).

The apparent density was found to be greatest for the sheets from the acetylated fibers and was distinctly lower for the butyrylated and stearoylated sheets. The same is shown by the hygroscopicity and the hygroexpansivity data.

Because the lengths of the acetyl (CH_3CO) and the butyryl ($CH_3.CH_2.CH_2.CO$) carbon chains are rather close together as compared with that of the stearoyl chain ($CH_3(CH_2)_{16}.CO$), one might expect that the difference between the effect of the latter and that of the butyryl chain would have been considerably greater than that shown in Table VII. Figure 13 shows that the bursting strength values of the butyrylated and stearoylated sheets are also much closer together than would have been expected. The sheets prepared from the unbeaten fibers showed a similar trend. It would thus appear that the maximum effect upon all three characteristics of the sheet is almost reached with the butyryl group and that the introduction of acyl groups with chain lengths between those of the butyryl and the stearoyl groups would change the results only relatively little. Figures 14 and 15 show the relative positions of the hygroscopicity and hygroexpansivity curves for the three esterified materials.

The similarity between the effects of the butyryl and the stearoyl groups places the former in a favorable position if a commercial preparation of a paper with reduced hygroscopicity and hygroexpansivity is contemplated. It was found that, as with the acetylated fibers, a fair proportion of the physical strength properties of the original fibers was retained when acetone was substituted for water as a beating and sheet-forming medium. This beneficial effect may be attributed to the swelling and solvating effect of the acetone upon the butyryl group in much the same way as was postulated for the case of the acetylated fibers *(3)*. The beneficial effect of using an emulsion of a relatively small amount of benzene in water instead of acetone can probably be explained on the same basis. It would seem possible that the small quantity of benzene, being homogeneously distributed in and transported by the water into the micellar structure of the fiber, suffices to bring about swelling and solvation of the butyryl groups. The use of a benzene-water emulsion (and probably of other like emulsions) instead of acetone would be an advantage in a commercial application of the process.

The failure to produce similar results with the stearoylated fibers in the presence of those organic solvents in which they acquired a distinct degree of swelling seems to suggest that the stearoyl chains are so long that they actually prevent the contact between fiber surfaces. A similar interpretation may explain the observation *(18)* made in a related field—namely, that a cellulose stearate film showed very little tensile strength (0.5 kg./sq. mm.) as compared with a butyrate film (5-6 kg./sq. mm.) and an acetate film (9-12 kg./sq. mm.). It would seem probable that the stearoylated cellulose chains, which tend to reorient themselves and to recrystallize when the solvent is evaporated from the cellulose stearate solution, are prevented from establishing close mutual contact because of the length of their protruding acyl chains. As a result, the cellulose ester chains tend to slip when the film is subjected to tensile stress. It is interesting to note that the tensile strength of the cellulose butyrate film ranged between those of the other two preparations.

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Chemical Machinery

The Reinhold Publishing Company has recently published a book entitled Chemical Machinery by Emil Raymond Riegel, Professor of Industrial Chemistry, University of Buffalo (583 pp. 6 x 9). It is an elementary treatise on equipment for the process industries. The devices described are of a type which may be purchased from a manufacturer as contrasted to special and homemade equipment.

The contents includes the following subjects of interest to the paper industry, factors in plant location, devices for reducing the size of solid materials, screening and grading equipment, conveying and elevating machinery, tanks, pumps, ejectors, weighing and proportioning equipment, agitators, mixing, kneading and blending equipment, settlers and thickeners, filters, evaporators, driers, vacuum pumps, heat exchangers, heat transfer agents, hydraulic pressure equipment, instruments (flow meters, volume meters, temperature controls, liquid level gauges, pH indicators, automatic valves, etc.).

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd street, New York 17, N. Y., at $5.00 per copy.

Discuss Mechanics of Operation

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., August 2, 1944—A committee of the Pulp and Paper Council of the Department of Commerce met here last week. At the meeting the mechanics of operations was discussed which will lead to further meetings. Those attending the meeting included John L. Riegal of the Riegal Paper Company; Z. D. Zink, vice president Strathmore Paper Company; Amos Hollingsworth, Penopscott Chemical Company; and T. W. Tinker, American Paper and Pulp Association.

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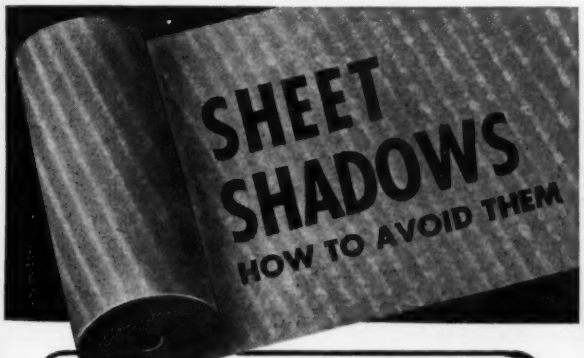

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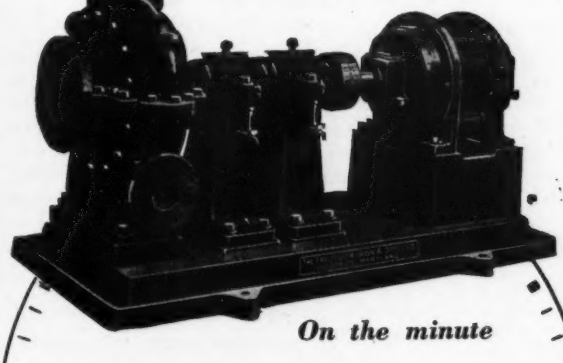

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New York Paper and Pulp Market Review

Paper Available For General Civilian Use May Be Reduced To 65 Percent of Total Production In Last Quarter—Essential Use of Pulp For More V-Boxes Increasing—Waste Paper Collections Fair.

Office of the PAPER TRADE JOURNAL,
Wednesday, August 2, 1944.

Requirements for paper are so heavy for essential military and civilian uses that a further limitation of important items for trade supply seems in prospect. About 10% less paper is expected to be available for general civilian use in last quarter of the current year. A gradual tightening in the supply situation is reflected in some of the many reports received this week from manufacturers' representatives, jobbers, and general paper merchants.

The OPA ruled on July 28 that prices on 16-pound mimeograph paper made from chemical wood pulp, apply only to that particular type of paper, and not to related types, such as fine and writing papers.

The index of general business activity for the week ended July 22 rose to 144.4, from 139.2 for the previous week, compared with 141.5 for the corresponding week last year. The index of paper board production was 149.8, compared with 146.5 for the previous week, and with 146.4 for the corresponding week in 1943.

Paper production for the weeks ended July 22 was estimated at 91.3%, compared with 90.1% for 1943, with 79.2% for 1942, with 101.9% for 1941, and with 87.6% for the corresponding week for 1940.

Paper board production for the week ended July 22 was 94.0%, compared with 97.0% for 1943, with 74.0% for 1942, with 92.0% for 1941, and with 74.0% for the corresponding week for 1940.

Wood Pulp

More wood pulp will go into the production of paper and paper board most essential for the war program in the last quarter, current reports seem to indicate. Military requirements for V-boxes, the Committee of Pulpwood Consuming Industries, stated this week, will consume more than 1,000,000 cords of pulpwood. Authoritative government sources stated that current estimates require 385,000,000 V-boxes in the current year and that the demand may rise to 440,000,000, because of extended military operations.

Rags

Mill demand for cotton cuttings is heavy with supplies reported under requirements. The market position is strong. Prices are firmly maintained.

Demand for all grades of old cotton rags is active. Prices are strong at ceilings.

Old Rope and Bagging

Demand for all fibers is active. Prices are firm at ceilings. No important change in the market position has been reported this week.

Trading in scrap bagging of all grades is at a low level. Mill stocks are reported at a good level and buyers take little interest in the market at this date. Prices are soft and continue nominal.

Old Waste Paper

Mill buying of waste paper continues heavy with all grades in demand at ceiling prices. In the opinion of many in the paper stock market, the discrepancies in the new pricing schedule, Amendment No. 8 to MPR No. 30, are a reversal of general trade grading practices. New box board chips at $14.50 per ton, compared with mixed paper at $19 per ton, are cited as one example of prices out of line, while the pricing of No. 1 heavy books at a higher ceiling than fly leaf shavings, is cited as another instance of the reversal of established trade grading practices.

Twine

Demand is active for all grades of twine. Prices are strong under the influence of rather limited supplies in the best grades now available for most civilian uses, especially for wrapping purposes.

Brown Co. Elects Vice Presidents

Brown Company, Berlin, N. H., producers of pulp, paper, and allied products, and Brown Corporation, La Tuque, P. Q. its Canadian pulp-producing subsidiary, announce the recent election of three additional vice presidents. Herman G. Schanche, general manager of woods operations since joining the company in March 1943, has now been elected vice president in charge of woods operations for both Brown Company and Brown Corporation. Mr. Schanche formerly was with Abitibi Power and Paper Company, Ltd. He has been active in the industry for many years and is presently a member of various industry committees and associations.

Downing P. Brown has been elected vice president of Brown Company; he will continue to be located in New York City. In the course of Mr. Brown's long service with the company he has filled various positions, the most recent of which has been as assistant to the vice president in charge of sales.

A new vice president of Brown Corporation is Wentworth Brown who will continue to serve as production manager of both Brown Company and Brown Corporation. Mr. Brown, who has been with the organization for a period of years, was, before being located in Berlin, for some time in charge of the Canadian mill.

All other officers of both companies continue in their present capacities.

R. D. Smith Goes with Erving Paper Co.

Richard D. Smith of 587 Bernadston road, Greenfield, Mass., who for 18 years has been connected with the Keith Paper Company of Turners Falls, has resigned his position and become associated with the Erving Paper Mills of Erving, Mass. At the time of his leaving Keith, Smith was in charge of the order department and assistant to the sales manager, while he had been employed in several other departments during his years at Keith.

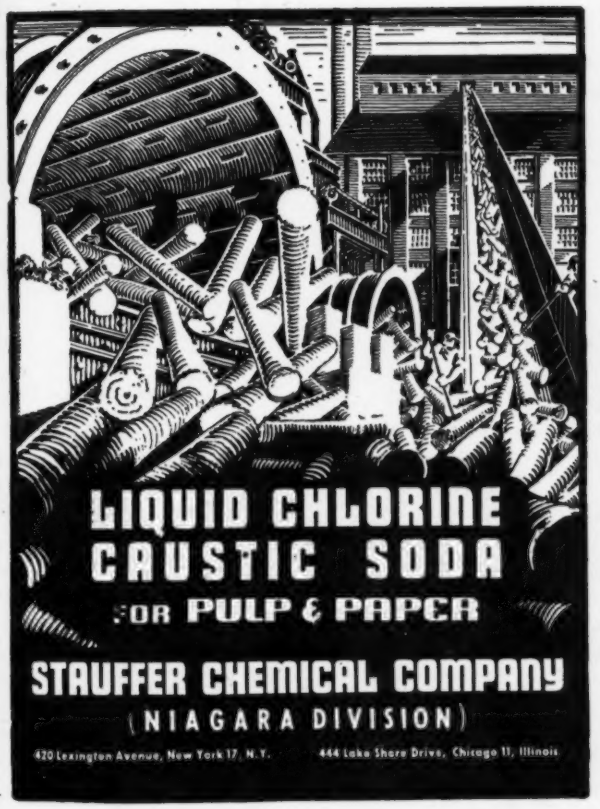
His resignation from Keith terminates more than a half century of his family's active service with that company. His father, Albert R. Smith of Turners Falls, was treasurer and general manager for many years, and he continues to serve on the board of directors.

ENGLISH ECCO CLAYS CLAYS

ECCO CLAYS
TRADE MARK

UNIFORM • SUPERIOR • DEPENDABLE

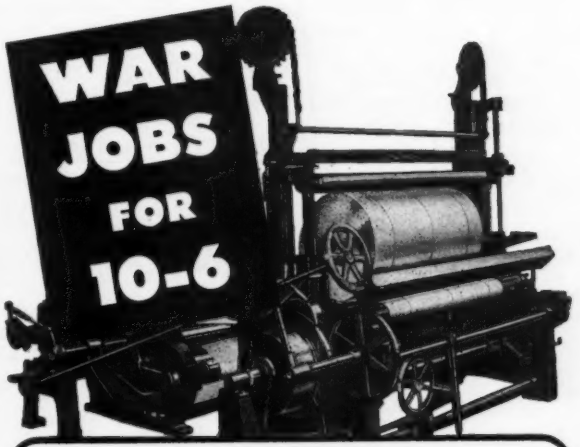
English China Clays Sales Corporation
551 Fifth Avenue, New York City



LIQUID CHLORINE
CAUSTIC SODA
FOR PULP & PAPER

STAUFFER CHEMICAL COMPANY
(NIAGARA DIVISION)

420 Lexington Avenue, New York 17, N.Y. — 444 Lake Shore Drive, Chicago 11, Illinois



Fast Camachine 10-6 converts chipboard, wad paper and overlay stock into various size rolls, as needed. Many ordnance production men have installed 10-6 to smash bottlenecks caused by shortage of rolls of proper width and diameter. Used also to convert bond paper and creped kraft into rolls of strip for making fuses. Produces clean-cut, uniformly wound rolls, of accurate widths. Write for additional information.

CAMERON MACHINE COMPANY, 61 Poplar St., Brooklyn 2, N. Y.
Midwest Office: Harris Trust Bldg., 111 W. Monroe St., Chicago 3

CAMACHINE

W. & L. E. GURLEY

Established 1845
Manufacturers of Instruments for Paper and Textile Testing
(Porosity — Smoothness — Softness — Stiffness — Curl — Shrinkage — Sizing)
Engineering and Surveying
Hydraulic Engineering
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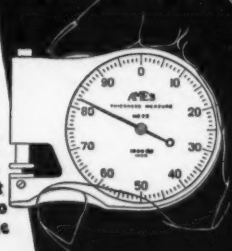
AMES THICKNESS MEASURE No. 25

The smallest, lowest priced, most accurate, durable and popular dial pocket gauge that has ever been made. Its case thickness is only ¼" and dial diameter 1⅜", yet measurements up to 5/16" can be made accurately.



B. C. AMES CO., WALTHAM MASS., U.S.A.

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, August 2, 1944.

BLANC FIXE—The market for blanc fixe continues to conform to prevailing quotations. Current demand fair. The pulp is currently quoted at $40 per ton, in barrels, at works; the powder is currently quoted at $60 per ton.

BLEACHING POWDER—Current demand is reported heavy. Supply situation reported less satisfactory. Bleaching powder is currently quoted at from $2.50 to $3.10 per 100 pounds. All prices in car lots, in drums, f.o.b. works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10 000 pounds or more, 25 cents per pound; 2,000 pounds, 24½ cents per pound; less than 2,000 pounds, 24¾ cents per pound, f.o.b. shipping point.

CAUSTIC SODA—Supply situation reported improved, with production and demand reported heavy. Market tight. Solid caustic soda is currently quoted at $2.30 per 100 pounds. The flake and ground are currently quoted at $2.70 per 100 pounds. All prices in car lots, in drums, f.o.b. works.

CHINA CLAY—Demand for some grades of china clay is reported moderate this week. Domestic filler clay is currently quoted at from $7.50 to $15 per ton; coating clay is quoted at from $12 to $22 per ton, at mines. Imported china clay is currently quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Production reported excellent. Demand for all uses heavy. Paper allowed 8% less, in third quarter. Prices remain unchanged. Chlorine is quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b. works.

ROSIN—Higher prices are quoted on some grades of rosin this week: "G" gum rosin is currently quoted at $5.45 per 100 pounds, in barrels, Savannah. "FF" wood rosin is currently quoted at $5.42 per 100 pounds, in barrels, New York. Seventy per cent gum rosin is currently offered at $5.72 per 100 pounds, f.o.b. works.

SALT CAKE—Demand reported moderate. Quotations on salt cake continue to remain unchanged. Domestic salt cake is currently quoted at $16 per ton.

SODA ASH—Market requirements for soda ash continue very heavy. Production reported higher but demand absorbs supplies. Prices continue unchanged. Prices on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Corn is reported coming into market in moderate volume, and industrial supply situation continues encouraging. Quotations continue unchanged. Pearl is currently quoted at $3.72 per 100 pounds. The powdered grade is currently quoted at $3.83 per 100 pounds. All prices f.o.b. Chicago.

SULPHITE OF ALUMINA—Supply situation is reported satisfactory. Quotations unchanged. Prices on the commercial grades are quoted at from $1.15 to $1.25 per 100 pounds. The iron free is currently quoted at $1.85 per 100 pounds. All prices in car lots, in bags, f.o.b. works.

SULPHUR—Demand is reported steady for sulphur. Quotations on all grades continue unchanged. Annual contracts are currently quoted at $16 per long ton, f.o.b. mines. The current contract price at Gulf Ports remains unchanged at $17.50 per long ton.

TALC—The market for domestic talc is reported moderately active. Quotations unchanged. Domestic grades are quoted at from $16 to $21 per ton, at mines.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the murrent maximum prices.

Paper

(Delivered New York)

Standard News, per ton—
Roll, contract... *$58.00 @ —
Sheets ..... 66.00 " —
* OPA Maximum Price.

Kraft—per cwt.—Carload Quantities Zone A, f.o.b. Mill
Superstandard Wrapping ....*$5.25 @ —
No. 1 Wrapping... *5.00 " —
Standard Wrapping*4.75 " —
Standard Bag.....*4.375 " —
* OPA Manufacturers' Prices.

Tissues—Per Ream—Carlots
White No. 1..... 1.12½" —
White No. 1 M. G. 1.10 " —
White No. 1½.... 1.00 " —
White No. 2..... .90 " —
Anti-Tarnish M.F.. 1.20 " —
Colored ..... — " —
Kraft ..... .95 " —
Manila ..... .90 " —

Toilet—1 M. Sheets—Per Case
Unbleached ..... 4.25 " —
Bleached ..... 5.70 " —
Unbl. Toilet, 1 M. 4.16 " —
Bleached Toilet.... 5.70 " —

Paper Towels, Per Case—
Unbleached, Jr..... 2.20 " —
Bleached, Jr. ..... 3.20 " —

Manila—per cwt.—C. l. f. a.
No. 1 Jute.....11.25 @ —
No. 1 Manila Wrapping, 35 lb..... 6.00 " 6.25
No. 2 Manila Wrapping, 35 lb..... 5.75 " 6.00

Boards, per ton—
News .....*48.00 @ —
Chip .....*48.00 " —
Sgl. Mla. Lt. Chip*60.00 " —
White Pat. Coated*75.00 " —
Kraft Liners 50 lb.*63.00 " —
Binders Boards... 84.00 " 116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	32.20 " 37.75	33.35 " 39.25
85% Rag	.... "	29.90 " 35.00
75% Rag	23.00 " 27.00	24.15 " 28.25
65% Rag	.... "	22.80 " 27.75
50% Rag	18.70 " 22.75	19.90 " 24.25
25% Rag	16.40 " 20.00	17.55 " 21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds	Ledgers
No. 1..	$10.55@$12.75	$11.70@$14.25
No. 2..	9.65 " 11.75	10.80 " 13.25
No. 3..	9.20 " 11.25	10.35 " 12.50
No. 4..	8.90 " 10.75	10.05 " 12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated...	$13.65@	$15.50
No. 2 Glossy Coated...	12.40 "	14.00
No. 3 Glossy Coated...	11.60 "	13.25
No. 4 Glossy Coated...	11.15 "	12.75
No. 1 Antique (watermarked)	10.25 "	11.75
No. 2 Offset	9.60 "	11.00
A Grade E. F.....	9.35 "	10.75
A Grade S. & S. C...	9.60 "	11.00
B Grade E. F.	8.85 "	10.25
B Grade S. C.	9.10 "	10.50
C Grade E. F.	8.55 "	9.75
C Grade S. C.	8.80 "	10.00
D Grade E. F.	8.25 "	9.50
D Grade S. & S. C...	8.50 "	9.75

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight Not Exceeding OPA Allowances.

Bl. Softwood Sulphite.....	$86.00
Unbl. Softwood Sulphite.....	74.00
Bl. Hardwood Sulphite.....	83.50
Unbl. Hardwood Sulphite.....	71.50
Bl. Mitscherlich	81.00
Unbl. Mitscherlich ..72.00 @	82.00
N. Bleached Sulphate	86.00
S. Bleached Sulphate	79.00
N. Semi-Bleached Sulphate...	82.00
S. Semi Bleached Sulphate...	75.00
N. Unbl. Sulphate.....	73.00
S. Unbl. Sulphate	63.50
Bl. Soda	72.00
Unbl. Soda	68.00
Groundwood	50.00

Transportation Allowances

Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area).....	10.50
West Coast (out area).....	16.50

	50%-80% Air Dry Weight
Northeast	11.50
Lake Central	11.50
Southern	14.00
West Coast (in area).....	9.50
West Coast (out area).....	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area)	7.50
West Coast (out area)	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices.

Domestic Rags

New Rags
(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—		
New White, No. 1..	6.50	@ 7.25*
Silesias No. 1.....	—	" 5.75*
New Unbleached...	6.75	" 7.50*
Blue Overall	—	" 5.50*
Fancy	—	" 3.50*
Washables	—	" 3.00*
Bleached Khaki Cuttings	—	" 4.25*
Unbleached Khaki Cuttings	—	" 3.50*

* OPA Maximum Prices.

PRICE & PIERCE »»»»»»»ltd•

Wood Pulp & Paper Agents

60 East 42 Street
New York, N. Y.

By inventing the cotton gin to pick the seeds from cotton, Eli Whitney added incalculably to the wealth of a mighty nation. Yankee ingenuity again. Call it research if you like. Lindsay desires by sincere effort to contribute materially to the improvement of Fourdrinier wire cloth and of the paper that is made from it.

THE LINDSAY WIRE WEAVING COMPANY
Serving the Paper Industry Since 1903
14001-14299 ASPINWALL AVE., CLEVELAND 10, OHIO

Lindsay WIRES
FOR PAPER MILLS

LAMINATED PAPERS

HAVE you planned for the unusual demand for this type of product after the war? • Ask about machines for laminating foil, paper, glassine, cellophane and boards. • We build them for pastes, glues, asphalts and waxes. • Can we send complete information? Ask us.

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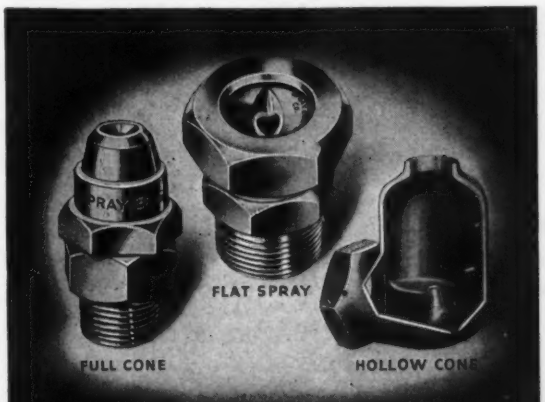
HUDSON-SHARP
MACHINE CO • GREEN BAY • WIS



SPRACO NOZZLES

Write for NOZZLE CATALOG *to*
SPRAY ENGINEER'NG CO.
118 CENTRAL STREET • SOMERVILLE 45, MASS.

Old Rags

White, No. 1—		
Repacked	*3.80	—
Miscellaneous	*3.20	—
White, No. 2—		
Repacked	*2.90	—
Miscellaneous	*2.65	—
Third and Blues—		
Repacked	*2.20	—
Miscellaneous	*1.80	—
Roofing Rags—		
No. 1	*1.55	—
No. 2	*1.45	—
No. 3 (bagging)	*1.35	—
No. 4	*1.35	—
No. 5A	*1.35	—
Old Manila Rope	5.75	—

OPA Maximum Prices.

Foreign Rags

All Prices nominal

New Rags

New Dark Cuttings	2.25	2.40
New Mixed Cuttings	2.00	2.20
New Light Silesias	5.50	5.75
Light Flannelettes	5.50	5.75
New White Cuttings	7.00	7.50
New Light Oxfords	4.00	4.50
New Light Prints	3.00	3.25

Old Rags

No. 1 White Linens	7.50	8.50
No. 2 White Linens	6.50	7.50
No. 3 White Linens	4.50	—
No. 4 White Linens	2.25	3.25
No. 1 White Cotton	4.25	4.75
No. 2 White Cotton	3.25	3.75
No. 3 White Cotton	2.50	3.00
No. 4 White Cotton	1.90	2.20
Extra Light Prints	2.00	2.40
Ord. Light Prints	1.75	2.15
Med. Light Prints	1.55	1.95
Dutch Blue Cottons	2.25	2.50
French Blue Linens	3.00	—
Checks and Blues	2.00	—
Linsey Garments	1.90	2.00
Dark Cottons	1.50	1.60
Old Shopperies	1.30	1.45
New Shopperies	1.45	1.50
French Blues	2.25	2.50

BAGGING

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—		
Foreign	Nominal	
Domestic	4.25	4.35
Wool Tares, light	4.25	4.50
Wool Tares heavy	4.50	5.00
Bright Bagging	4.50	4.85
Manila Rope—		
Foreign	—	—
Domestic	*5.75	—
Jute Threads	5.50	—
No. 1 Sisal Strings	*4.00	—
Mixed Strings	2.00	—

*OPA Maximum Price.

Old Waste Papers

(F. o. b. New York)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	3.37½	—
No. 1 Hard White Envelope Cuts	3.12½	—
No. 1 Hard White Shavings, unruled	2.87½	—
No. 1 Hard White Shavings, ruled	2.50	—
Soft White Shavings, one cut	2.87½	—
No. 1 Soft White Shavings	2.50	—
Soft White Shavings, Misc.	2.15	—
No. 1 Fly Leaf Shavings	1.67½	—
No. 2 Fly Leaf Shavings	1.12½	—
No. 1 Groundwood Fly Leaf Shavings	1.25	—
No. 2 Mixed Groundwood Fly Leaf Shavings	.90	—
Mixed Colored Shavings	.75	—
Mixed Groundwood Colored Shavings	.90	—
Overissue Magazines	1.67½	—
No. 1 Heavy Books & Magazines	1.92½	—
Mixed Books	1.10	—
No. 1 White Ledger	2.30	—
No. 2 Mixed Ledger, colored	2.00	—
New Manila Envelope Cuttings, one cut	2.87½	—
New Manila Envelope Cuttings	2.65	—
Extra Manilas	1.95	—
Mixed Kraft, Env. & Bag Cuttings	2.75	—
Kraft Envelope Cuttings	3.25	—
Triple Sorted, No. 1 Brown Soft Kraft	2.50	—
New 100% Kraft Corrugated Cuttings	2.25	—
No. 1 Assorted Old Kraft	1.75	—
New Jute Corrugated Cuttings	.90	—
Old 100% Kraft Corrugated Containers	1.75	—
Old Corrugated Containers	1.40	—
Box Board Cuttings	.72½	—
White Blank News	1.65	—
Overissue News	1.10	—
No. 1 News	1.00	—
No. 1 Mixed Paper	.95	—
Old Corrugated Containers	.82½	—
Mill Wrappers	1.10	—

Twines

All Prices Nominal

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—		
India	.21	—
White Hemp	.21	—
Fine Polished—		
Fine India	.26	—
Unpolished—		
Box	.17¼	—
Paper Makers	.17	—
Tube Rope	.19	—
Wall Paper	.20½	—
Wrapping	.23	—
Soft Fiber Rope	.19	—
Cotton	.25	—

(Hard Fiber)

Medium Java	.18	—
Mex. Sisal	.16	—
Manila	—	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill.)

Shirt Cuttings—	
New White No. 1	.07¼
New White No. 2	.05¾
Light Silesias	.05¾
Black Silesias, soft	.03¾
New Unbleached	.07½
Washable Prints	.04¾
Washable No. 1	.03
Blue Overall	.05½
Cottons—According to grades—	
Washable shredding	.01¾
Fancy Percales	.04¾
New Black Soft	.03¼
Khaki Cuttings—	
Unbleachable Cotton Cuttings	.03½
Bleachable Cotton Cuttings	.04¼
Men's Corduroy	.03½
Ladies' Corduroy	.03
Cottonades	.03¼

Domestic Rags (Old)

White No. 1 — Repacked	3.80	—
Miscellaneous No. 1	3.20	—
Miscellaneous No. 2	2.65	—
White No. 2 — Repacked	2.90	—
Thirds and Blues—		
Miscellaneous	1.80	—
Repacked	2.20	—
Black Stockings— (Export)	Nominal	
Roofing Stock—		
Foreign No. 1	Nominal	
Domestic No. 1	1.55	—
Domestic No. 2	1.45	—
Roofing Bagging	1.35	—
Old Manila Rope	5.75	—

Bagging

(F. o. b. Phila.)

Gunny No. 1—		
Foreign	Nominal	
Domestic	3.00	3.50
No. 1 Clean bright— Sisal Strings		.04
No. 2 Clean bright— Sisal Strings		.03
Sisal Jute	.02½	.02¾
Scrap—		
No. 1	3.25	3.50
No. 3	1.75	1.90
Wool Tares	4.00	4.25
No. 1 New Light Burlap	3.00	4.00
New Burlap Cuttings	3.75	4.00

Old Papers

(F. o. b. Phila)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	3.37½	—
No. 1 Hard White Shavings, unruled	2.87½	—
Soft White Shavings, one cut	2.50	—
White Blank News	1.65	—
Soft White Shavings, Misc.	2.15	—
No. 1 Fly Leaf Shavings	1.67½	—
No. 2 Fly Leaf Shavings	1.12½	—
No. 1 Groundwood Fly Leaf Shavings	1.25	—
No. 2 Groundwood Fly Leaf Shavings	.90	—
Mixed Colored Shavings	.75	—
New Manila Envelope Cuts, one cut	2.87½	—
Hard White Envelope Cuts, one cut	3.37½	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	—
Mixed Kraft Env. & Bag Cuttings	2.75	—
Kraft Envelope Cuttings	3.25	—
No. 1 Heavy Books & Magazines	1.92½	—
New Manila Envelope Cuts, one cut	2.87½	—
New Manila Envelope Cuttings	2.65	—
White and Colored Tabulating Cards	2.25	—
Ground Wood Tabulating Cards	1.35	—
White Blank News	1.65	—
No. 1 Assorted Old Kraft	1.75	—
No. 1 Mixed Paper	.95	—
Overissue News	1.10	—
Box Board Cuttings	.72½	—
New Corrugated Cuttings, Kraft	2.25	—
Old 100% Kraft Corrugated Containers	1.75	—
Old Corrugated Containers	1.40	—
Jute Corrugated Cuttings	1.07½	—

Bagging

(F. o. b. Boston)

Gunny Bagging—		
Foreign	(nominal)	
Domestic	—	2.75
Sisal Rope No. 1	*4.75	—
Sisal Rope No. 2	*4.25	—
Mixed Rope	—	1.55
Transmission Rope—		
Foreign	(nominal)	
Domestic	2.75	3.00
Manila Rope—		
Foreign	(nominal)	
Domestic	5.75	—
Soft Jute Rope	5.25	—
Jute Car Threads	3.00	3.50
Bleachery Burlap	8.50	9.00
Scrap Burlap—		
Foreign	(nominal)	
Domestic	—	2.50
South American	—	3.00

BOSTON

Old Papers

(F. o. b. Boston)

OPA Maximum Prices, Baled

No. 1 Hard White Shavings, unruled	2.87½	—
No. 1 Hard White Shavings, ruled	2.50	—
Soft White Shavings, Misc.	2.15	—
No. 1 Fly Leaf Shavings	1.67½	—
No. 2 Fly Leaf Shavings	1.12½	—
No. 1 Groundwood Fly Leaf Shavings	1.25	—
No. 2 Groundwood Fly Leaf Shavings	.90	—
Mixed Colored Shavings	.75	—
New Manila Envelope Cuts, one cut	2.87½	—
Hard White Envelope Cuts, one cut	3.37½	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	—
Mixed Kraft Env. & Bag Cuttings	2.75	—
Kraft Envelope Cuttings	3.25	—
No. 1 Heavy Books & Magazines	1.92½	—
New Manila Envelope Cuts, one cut	2.87½	—
New Manila Envelope Cuttings	2.65	—
White and Colored Tabulating Cards	2.25	—
Ground Wood Tabulating Cards	1.35	—
White Blank News	1.65	—
No. 1 Assorted Old Kraft	1.75	—
No. 1 Mixed Paper	.95	—
Overissue News	1.10	—
Box Board Cuttings	.72½	—
New Corrugated Cuttings, Kraft	2.25	—
Old 100% Kraft Corrugated Containers	1.75	—
Old Corrugated Containers	1.40	—
Jute Corrugated Cuttings	1.07½	—

Bagging

(F. o. b. Boston)

Gunny Bagging—		
Foreign	(nominal)	
Domestic	—	2.75
Sisal Rope No. 1	*4.75	—
Sisal Rope No. 2	*4.25	—
Mixed Rope	—	1.55
Transmission Rope—		
Foreign	(nominal)	
Domestic	2.75	3.00
Manila Rope—		
Foreign	(nominal)	
Domestic	5.75	—
Soft Jute Rope	5.25	—
Jute Car Threads	3.00	3.50
Bleachery Burlap	8.50	9.00
Scrap Burlap—		
Foreign	(nominal)	
Domestic	—	2.50
South American	—	3.00
Wool Tares—		
Foreign	(nominal)	
Domestic	4.25	
Aust. Wool Pouches	—	3.25
New Zealand Wool Pouches	—	3.50
New Burlap Cuttings	4.75	5.00
Heavy Baling Bagging	4.00	4.25
Paper Mill Bagging	2.50	3.00
No. 2 Roofing Bagging	1.35	—

*OPA Maximum Price.

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—		
New Light Prints	.04½	.04¾
Fancy Percales	.04¾	.05
New White No 1.	.06¾	.07
New Light Flannelettes	.05½	.06
Canton Flannels, Bleached	.06	.06¼
Underwear Cutters, Bleached	.06¼	.06¾
Underwear Cutters, Unbleached	.05¾	.06
Silesias No. 1	.06	.06¼
New Black Silesias	.03	.03½
Red Cotton Cuttings	.03½	.04
Soft Unbleached	.06½	.06¾
Blue Cheviots	.05½	.06
Fancy	.02¾	—
Washable	.02¾	—
Khaki Cuttings	.02¾	.03
O. D. Khaki	.03½	.03¾
Corduroy	.03¾	.03½
New Canvas	.06¼	.06¾
B. V. D. Cuttings	.06¼	.06¾

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1— Repacked	3.80	—
Miscellaneous	3.20	—
White No. 2— Miscellaneous	2.65	—
Twos and Blues, Repacked	2.20	—
Old Blue Overalls	2.25	2.50
Thirds and Blues, Repacked	2.20	—
Miscellaneous	1.80	—
Black Stockings	3.50	4.00
Roofing Stock—		
No. 1	1.55	—
No. 2	1.45	—
No. 3	1.35	—
No. 4	1.35	—
No. 5, Quality A	1.35	—
Quality B	1.20	—
Quality C	.95	—
Old Manila Rope	5.75	—

*OPA Maximum Prices.

Foreign Rags

(F. o. b Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)

OPA Maximum Prices, Baled

Shavings—		
No. 1 Hard White Envelope Cuts, one cut	1.37½	—
No. 1 Hard White Shavings, unruled	2.87½	—
No. 1 Soft White Shavings	2.50	—
No. 1 White Ledger	2.30	—
No. 1 Heavy Books & Magazines	1.92½	—
White Blank News	1.65	—
Mixed Kraft Env. & Bag Cuttings	2.75	—
No. 1 Assorted Old Kraft	1.75	—
Overissue News	1.10	—
No. 1 News	1.00	—
No. 1 Mixed Paper	.95	—
No. 1 Roofing Rags	1.55	—
No. 1 Roofing Bags	1.45	—